# Nuclear weapons in the India-Pakistan context.

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**Title:** Nuclear Weapons in the India-Pakistan Context

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Description:

This thesis deals with the possible employment of nuclear weapons in the ongoing confrontation between India and Pakistan.

After reviewing the nuclear capabilities of both Indian and Pakistan and assessing their possible delivery systems, this dissertation explores the emerging picture regarding the Indian and Pakistani nuclear doctrines.

It is argued that, after exploring the current structure of the armed forces in both countries and after analyzing the theatres of operations, it is highly unlikely that either country seeks to employ nuclear weapons in a tactical, battlefield role. It is also argued that neither India or Pakistan is making an effort to evolve a nuclear war-fighting doctrine. Moreover, it is shown that nuclear weapons have simply led to a re-thinking of military tactics on the part of India so as to minimize the chance of a nuclear strike by limiting the aims and objectives of any Indian military action.

In stark contrast, it is shown that South Asian cities present far more lucrative targets for nuclear strikes. As a result of this and the geographic and tactical limitations of South Asian battlefields, it is argued that both India and Pakistan have based their fledgling nuclear strategies around a 'city-busting' concept. The existing command and control systems in both countries are examined and found to be adequate if both countries adopt a strict 'second-strike' approach to the employment of nuclear weapons.

It is further argued that nuclear weapons, while limiting the scale of any future India-Pakistan war, will not play a major role in preventing a conflict between the two countries. Rather, the basic operational parity that exists between the two countries in terms of their conventional forces is responsible for preventing the outbreak of war.

The thesis also briefly explores the rationale behind the acquisition of nuclear weapons in both countries and on their basic security perceptions. The issue of confidence building measures and the international impact of nuclearization in South Asia are also examined.

An epilogue is also included so as to deal with the implications of the May 1998 nuclear tests by India and Pakistan which took place as this thesis was being printed.

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## Introduction

India and Pakistan have been rivals since their inception some fifty years ago. The two countries have fought three major war and to this day, routinely exchange artillery fire across the Line of Control in Kashmir while fighting an undeclared war in the inhospitable environment of the Siachen glacier. Moreover, the strained relationship between India and Pakistan is further complicated by India's claims that Pakistan has aided and abetted terrorist groups operating against India, first in Punjab and now in Jammu and Kashmir.

To this already tense situation must be added the nuclear factor. India and Pakistan are called 'threshold' nuclear weapons states. Perhaps a more accurate term would be 'undeclared' nuclear weapons states. Both countries have moved so far along the path to nuclear weaponization that it is very difficult to not consider them *de facto* nuclear weapons states.

This thesis examines the nuclear aspect of the India-Pakistan conflict in the period up to early April 1998. It does not delve deeply into the proliferation implications of a nuclearized South Asia, nor does it seek to suggest that nuclear weapons are either necessary or unnecessary for South Asian security. Rather, this thesis accepts that India and Pakistan see nuclear weapons as an integral part of their legitimate security requirements. As might be expected, however, some of the weapons programs discussed in this thesis are ongoing projects and as such continue to evolve. This is particularly true regarding Indian and Pakistani programs for 'boosted'-fission and thermonuclear weapons and for ballistic missiles.

The South Asian nuclear equation has been examined in many books and journal articles.[1] However, this has often been done from the nuclear proliferation angle or as a study of the nuclear policies of India and Pakistan over a number of years.[2] This thesis takes a somewhat different approach.

The thesis has one underlying assumption - India and Pakistan have the capability to manufacture nuclear weapons and to deliver them. Neither country has shown any inclination to give up either their weapons capability or their delivery systems, and as such it can be assumed that they will continue work on both nuclear weapons and ballistic missiles. With this in mind, this thesis addresses one of the major questions that arises - how will India and Pakistan employ nuclear weapons ?It will be argued that India and Pakistan will most probably employ nuclear weapons as strategic counter-value rather than as tactical counter-force systems. By counter-force, it is meant that attacks will be mounted against opposing military assets rather than population or industrial centres, which would be considered counter-value targets.[3]

This argument will be supported by an analysis of the India-Pakistan theatres of military operations and the current tactics of both armies in addition to the limitations that terrain and troop deployment place of the effective employment of nuclear weapons on the battlefield. Moreover, the vulnerability of South Asian urban centres will be illustrated by assessing strategic air defences in both India and Pakistan as well as

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[1] A number of these are cited in this chapter and throughout the thesis.

[2] One 1996 PhD thesis by W.P.S.Sidhu of Cambridge University dealt with the nuclear doctirnes of India and Pakistan between 1947 and 1990

[3] C. Campbell, Nuclear Facts: A Guide to Nuclear Weapon System and Strategy ( London: Hamlyn Publishing Group Limited, 1984 ), p.186

showing the potential impact of a nuclear strike on the cities of the two countries.[4]

Pakistan and India form the most dangerous part of an Asian nuclear triangle. India and Pakistan have an intense rivalry over the region of Kashmir and have fought three major wars. The two South Asian rivals are also involved in an undeclared war over the inhospitable Siachen Glacier and routinely exchange artillery fire.[5] The other country that plays a major role in this region is China. China and Pakistan have a long and well-established military relationship that extends into the nuclear and ballistic missile fields. On the other hand, China and India have a somewhat strained relationship. In 1962 the two countries fought a vicious border war and since then India has become increasingly alarmed at both China's own nuclear arsenal as well as the extensive help China has provided to Pakistan's nuclear weapons and ballistic missile capability.[6] Moreover, the Sino-Indian border dispute has not been resolved, even though the tension along this border is much lower than along the Line of Control in Kashmir. India still harbours fears about China's intentions in South Asia has meant that India's nuclear weapons and missile programs are aimed at providing a deterrent against China in addition to dealing with the more immediate threat of a nuclear armed Pakistan.[7]

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[4] This will be discussed in Chapter Five

[5] E.W.Desmond, 'War on High Ground' in *Time International*: July 17 1989, pp.14-21

[6] The Sino-Pakistan relationship with respect to nuclear weapons and ballistic missiles is discussed in Chapters Two and Three.

[7] This is discussed in K.Subramanyam, India's Security Perspectives ( New Delhi: ABC Publishing House, 1982 )
A more recent view is found in V.K. Nair, Nuclear India ( New Delhi: Lancer International, 1992 )

As this thesis confines itself to the India-Pakistan conflict up to early April 1998, China is mentioned as part of a discussion of India's threat perceptions and for its role in assisting Pakistan's nuclear and missile programs. Moreover, while some mention will be made about South Asian nuclear debates, it must be remembered that this thesis goes beyond the proliferation debate and examines emerging trends for possible nuclear weapons employment.[8]

Chapter One of this thesis gives an outline of the place that nuclear weapons occupy in South Asian security perceptions. The chapter begins with an overview of the South Asian political situation and a brief discussion of 'nuclear nationalism', that is, the place that the nuclear option occupies in the political landscape of India and Pakistan.[9] It further discusses the evolution of the Indian and Pakistani defence policy and explores the internal security preoccupations of both India and Pakistan by examining the forces deployed for these tasks. It also details the emergence of nuclear weapons in the South Asian scenario in 1987 after a major crisis between the two countries. In addition, the roles played by the Soviet Union and now Russia in aiding the Indian military and the roles played by China and the United States in assisting Pakistan will also be discussed.

Chapters two and three deal with the nuclear weapons potential of India and Pakistan, and the capabilities of their delivery systems. It is shown that India has a very considerable nuclear weapons potential, with a large stockpile of fissile material and is working on advanced nuclear weapons, including boosted fission and thermonuclear

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[8] The South Asian nuclear debates are discussed later in the Introduction as well as in Chapter One.

[9] The phrase 'nuclear-nationalism' is believed to be an invention of the author. However, since the concept has been around for some time, it is possible that the phrase has been used before.

weapons. Pakistan, on the other hand, has a somewhat smaller potential, but has made considerable progress, with Chinese assistance, towards improving its production capacity for nuclear weapons.

With respect to delivery systems, both manned aircraft and ballistic missiles are discussed. India's Integrated Guided Missile Development Program is analyzed in some detail as is the Indian satellite launch vehicle program. The links between the Indian missile program and its space program are dealt with in some detail, in addition to the performance and characteristics of the current missiles in service. Pakistan's much more limited missile program is discussed as well as Chinese assistance to Pakistan's ongoing projects. The quantity and quality of manned aircraft available for nuclear strikes are also discussed.

Chapter four of this thesis argues that neither India nor Pakistan is working towards a tactical nuclear war-fighting doctrine. Both countries have significant nuclear and ballistic missile capabilities along with large and well-equipped air forces; however, there is no evidence that either country is moving towards developing the very-low yield devices that were a feature of the tactical nuclear arsenals of NATO and the Warsaw Pact during the Cold War.[10]

An assessment of the armies of both countries shows that there seems to be no move towards an integration of nuclear weapons into their armed forces tactical

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[10] In the 1980s, for example, NATO deployed close to 6000 tactical nuclear warheads including approximately 2250 artillery shells for 155mm and 203mm self-propelled guns. The M422 shell for the 203mm gun carried the W-33 warhead with a yield of 2 kilotons. The advent of enhanced-radiation weapons saw the development of the M753 shell with the W-79 warhead with a yield of 0.7 kilotons.
See: C.Campbell, Nuclear Facts pp.131-135

doctrines and that passive defensive measures and training appear to be somewhat limited. A relatively detailed analysis of the battlefield zones of the India-Pakistan zone of conflict and a study of India's new military doctrine shows that as far as the India-Pakistan conflict is concerned, nuclear weapons are of very dubious utility against military targets.

Instead, both India and Pakistan seem to base their fledgling nuclear strategy on a 'counter-value', or, more accurately, on a 'city-busting' strategy,as will be shown in chapter five.[11] Looking at the strategic air defences in both countries, it will be seen that Pakistani targets are extremely vulnerable to Indian nuclear strikes, while Indian targets, though somewhat better protected by a potent air-defence network, present lucrative targets to a Pakistani nuclear strike. The effects of nuclear strikes on South Asian cities is also discussed in some detail, as is the inadequate civil defence network available to both countries, with India being used as the example.

This thesis addresses the question of nuclear deterrence in the India-Pakistan context from a different angle. It is argued that the threat of nuclear strikes may not actually prevent war, but has led to a re-orientation of India's military strategy. Instead of fighting a conventional war aimed at capturing territory, India has switched to a strategy of aiming to inflict maximum attrition on Pakistan's armed forces. Nuclear weapons would limit the objectives of a war, but have little to do with the risk of war starting.

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[11] The adoption of a 'city-busting' strategy is the one aspect that virtually all analysts of the India-Pakistan conflict agree on. Even nuclear 'hawks' such as Brigadier V.K.Nair, Nuclear India ( New Delhi: Lancer, 1992 ) and General K. Sundarji, Blind Men of Hindoostan ( New Delhi: UBS, 1994 ) have not even suggested the deployment of low-yield tactical nuclear weapons in the India-Pakistan context.

Rather, it is argued that a basic operational parity exists between India and Pakistan. Pakistan makes every endeavour to maintain this operational parity, even going to the extent of procuring ballistic missiles and their technology from China in order to match India's own missile production capacity. It is this parity that maintains the 'uneasy peace' in South Asia and any development that upsets this tenuous balance could lead to a full-scale conventional war.

Chapter six deals with the political implications of a nuclear South Asia. This chapter explores the extent of public support for nuclear weapons in both India and Pakistan, with some interesting survey data being available for India. It also investigates the economic risks of nuclearization in South Asia since, any such move may well be followed by the imposition of sanctions by some countries. The chapter ends with an exploration of confidence building measures in South Asia and their failure to lead to a reduction in the tension between India and Pakistan.

This is not a thesis about nuclear or ballistic missile proliferation, nor is it a thesis about deterrence theory. As explained earlier, it is a thesis that accepts that nuclear weapons are an integral part of the South Asian security landscape and endeavours to understand the possible size and composition of nuclear arsenals. This thesis also examines the possible use of these weapons in the event that the current tension between the two rivals leads to a full-scale war which might start out as a 'conventional' conflict but which could lead to the use of nuclear weapons.

The nuclearization of India and Pakistan comes at a time when the nuclear debate in the West is taking an interesting direction. Nuclear weapons, with the end of the Cold

War and the demise of the Soviet Union in 1991, no longer occupy the place of importance in Western arsenals they once did. Both Russia and the United States are reducing their nuclear arms stockpiles under the START 1 and, eventually, the START 2 treaties, while the United Kingdom has recently phased out the last of its nuclear gravity bombs.[12] The morality of nuclear weapons has long been questioned, but with the end of the Cold War, this debate has become even more prominent since the principal threat seems to have disappeared.

Writing in *International Affairs* in July 1993, Michael Quinlan, a former official of the United Kingdom Ministry of Defence, argued that there were five reasons for Western powers retaining a nuclear military capability, one of these being the need to deter threats by non-Western nuclear weapons states.[13] Quinlan also argues that nuclear weapons proliferation should be kept to a minimum, but he does not advocate the abolition of all nuclear weapons.

Professor Michael MccGwire takes a somewhat different view. Writing in April 1994, MccGwire asks whether there is a future for nuclear weapons at all.[14] MccGwire systematically rebuts Quinlan's arguments in favour of the retention of nuclear weapons and argues that the difficulties of preventing proliferation in a world where five states, namely Russia, the United States, France, China and the United Kingdom, legitimize their possession of nuclear weapons are considerably increased. This has been a long-

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[12] See *Air Forces Monthly*: June 1998, p.2

[13] M.Quinlan, 'The Future of Nuclear Weapons', in *International Affairs:* Vol 69, No.3 July 1993, pp.485-496

[14] M. MccGwire, 'Is there a future for Nuclear Weapons', *International Affairs:* Vol 70, No.2 April 1994, pp.211-228

standing complaint on the part of the Indian government and was the reason for India's rejection of the Non-Proliferation Treaty in 1970.[15] MccGwire has, in the past, put forward arguments suggesting that deterrence was part of the problem and not the solution.[16] It should be pointed out that political scientist Kenneth Waltz, writing in *Adelphi Paper 171*, goes even further in suggesting that more nuclear powers may actually be better.[17] It would be most interesting to see if Waltz would change his views in the event of an overtly nuclear South Asia.

Agreeing with Professor MccGwire on the need for the abolition of nuclear weapons is Jonathan Schell, a long-time writer for the *New Yorker* magazine. In 1998, Schell wrote *The Gift of Time* which outlined a well argued case for the complete abolition of nuclear weapons.[18] Towards the end of this book, Schell proposed turning the image of nuclear escalation upside down into a path to nuclear safety based on a de-escalatory process, leading to the eventual abolition of nuclear weapons.[19] Schell's desire for a nuclear-free world has not found much favour among the political leadership of the five recognized nuclear powers.

In a somewhat less passionate vein,Professor John Baylis continued the debate

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[15] For a discussion of India's position, one of the most detailed works available is A.Kapur, India's Nuclear Option: Atomic Diplomacy and Decision Making ( New York: Praeger, 1976 )

[16] M.MccGwire, 'Deterrence: the problem - not the solution' in *International Affairs:* Vol 62, No.1 Winter 1986, pp.55-70

[17] K.Waltz, 'The spread of Nuclear Weapons: More may be better' Adelphi Paper 171 ,( London: IISS, 1981 )

[18] J.Schell, The Gift of Time: The Case for Abolishing Nuclear Weapons Now , ( New York: Metropolitan Books, 1998 )

[19] ibid p.220

between those advocating a nuclear weapons-free world and those who believe that nuclear weapons have a legitimate place in Western security interests.[20] Baylis points out that, despite the substantial reductions in the nuclear arsenals of the United States and Russia, the nuclear framework of the Cold War would remain intact. He further points out that even the proposed end to the production of fissile material would have no effect on the existing nuclear powers who already have sufficient stockpiles. This explains why neither India nor Pakistan is particularly eager to participate in the talks for the Fissile Material Cut-off Treaty since such a treaty would effectively cap the fissile material stockpiles of the 'threshold' nuclear states while having virtually no impact on the massive stockpiles of the five nuclear powers.

Baylis also draws attention to the concept of 'virtual deterrence', proposed in 1984 by Jonathan Schell. This concept is based on the banning of completed nuclear weapons while allowing nations to keep the components of nuclear weapons in order to facilitate nuclear rearmament. McGeorge Bundy refered to this concept as 'existential deterrence' and ties in with George Perkovich's ideas about non-weaponized deterrence in South Asia.[21] Perkovich bases his views on his belief that neither India nor Pakistan has actually weaponized their nuclear capabilities. As this thesis will show, in the cases of India and Pakistan, the weaponization of nuclear capabilities can be accomplished on fairly short notice and as such it is somewhat questionable whether the term 'existential deterrence' accurately defines the current nuclear scenario in South Asia.

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[20] J.Baylis, 'The Future of Nuclear Weapons: Balancing Power and Morality' in *International Relations:* Vol 13, No.5 August 1997,pp.1-14

[21] G.Perkovich, 'A Nuclear Third Way in South Asia', in *Foreign Policy*: No.91 Summer 1993, pp.85-104

In South Asia, the nuclear issue has been hotly debated by leading scholars and intellectuals, with those favouring overt nuclearization or the continuing of the status quo greatly outnumbering those in favour of disarmament.[22] In fact, the anti-nuclear lobbies in both India and Pakistan are, however, relatively small and ineffective in comparison to the vast campaigns waged by the disarmament lobbies in the Western world. In neither India nor Pakistan, for example, has there been anything to rival the massive protests undertaken by Greenpeace and the Campaign for Nuclear Disarmament (CND) first in the late 1950s and early 1960s and then again in the late 1970s and early 1980s. The anti-nuclear activists of India and Pakistan, led by Praful Bidwai and Achin Vanaik, do however share another thing with their bretheren in CND - they are often branded as traitors.[23] This is perhaps not surprising given the hostility between India and Pakistan and the prestige both countries have attached to their nuclear capabilities.

The Indian and Pakistani anti-nuclear activists face formidable intellectual opposition. The nuclear 'hawks' of India are led by the extremely articulate ( and somewhat acerbic ) scholar Krishnaswamy Subramanyam.[24] Subramanyam has consistently argued India's need for nuclear weapons in order to deter China and

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[22] The debate in India regarding the India-Pakistan nuclear situation started in earnest in the 1980s. One of the first works on this subject was B.Sen Gupta, Nuclear Weapons ? Policy Options for India, ( New Delhi: Sage Publications, 1983 ).
In Pakistan, the quest for nuclear weapons was started by Z.A.Bhutto and outlined in his book If I am Assasinated. ( New Delhi: Vikas Publishing House, 1979 )

[23] CND activists were accused of being Soviet agents at the height of the Cold War- see C.Campbell, Disarmament Debates, ( London: MacDonald & Co. Publishers Ltd., 1984 ), p.43
Praful Bidwai and Achin Vanaik are two left-wing scholars who have been vocal critics of India's nuclear program. Both have received death threats as a result of their criticism. However, neither of them is backed by an institution as powerful as Greenpeace or CND.

[24] Krishnaswamy Subramanyam is perhaps the best known strategic thinker in South Asia. He once headed India's Institute for Defence Studies and Analysis and was a security advisor to the late Indian Prime Minister Rajiv Gandhi.

Pakistan and has maintained that nuclear weapons can only be deterred by nuclear weapons.[25] In more recent time, Subramanyam has been joined by the former Chief of Army Staff, General Krishnaswamy Sundarji, and Air Commodore Jasjit Singh in articulating India's position on nuclear weapons.

While intellectuals in the West debate the utility of nuclear weapons in the post-Cold War era, India and Pakistan are only now beginning to evolve their own nuclear strategies since it is only recently that these two countries have accquired the werewithal to develop fairly sophisticate nuclear arsenals. It remains to be seen whether these two *de facto* members of the nuclear club emulate the nuclear stategies that governed the arsenals of the Cold War rivals, or whether unique concepts will evolve. It must be remembered that NATO and the former Warsaw Pact had decades to work out nuclear strategies and tactics. In South Asia, on the other hand, only the first trends of nuclear strategy are beginning to emerge.

The political landscape of South Asia has changed. In India, the world's largest democracy, there has been a significant decline in the political fortunes of what was once India's dominant political party, the Indian National Congress ( also known as the Congress party ). For years there was a certain continuity in Indian security policy in general and nuclear policy in particular, however, this has now changed. In India, the

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[25] K.Subramanyam, 'Implications of Nuclear Asymmetry' , in Subramanyam ed. Nuclear Myths and Realities ( New Delhi: ABC Publishing House, 1981 ), pp.201-209. Anti-nuclear activists have occasionally countered that India could deploy conventional air forces to wreak the same havoc such as the United States did in the 1991 Gulf War. In an astounding display of naivete, the anti-nuclear activists completely ignore the vast costs of maintaining air forces of the size and technological sophistication of the USAF. Nuclear weapons costs, while hardly modest, might actually be cheaper.
See K.Bajpai, 'Abstaining: The Nonnuclear Option', in D.Cortright & A.Mattoo ed. India and the Bomb: Public Opinion and Nuclear Options ( Notre Dame, Indiana: University of Notre Dame Press, 1996 ),pp.23-52.

pro-nuclear lobby has been strengthened by the rise to power of the Bharatiya Janata Party (BJP) and the corresponding demise of the Congress party. The BJP has moved away from being a political pariah in India and has supplemented the Congress party as a dominant force in Indian politics. This was somewhat unexpected since the author, in November 1993, had the opportunity to speak with Professor Milton Israel who teaches at the South Asian Studies Department of the University of Toronto, and was extremely doubtful when it was suggested that the BJP could ever rise to such heights.[26] Indeed, when this discussion took place it did seem that the BJP's political fortunes were on the decline. However, three years later they emerged as the largest single political party in India and in 1998 were able to form a government. In Pakistan, the democratic process is less evolved and the political process is dominated between the power blocs controlled by the encumbent Prime Minister Nawaz Shariff and those of his rival, Benazir Bhutto.

With respect to sources, the author was able to find a fair quantity of published material dealing with the subject. However, many deal with the subject from a proliferation or arms control perspective and their utility for this thesis was somewhat limited since they fail to address the issue of the integration of nuclear weapons into war-fighting doctrines. Most published sources tend to deal with nuclear weapons as a proliferation issue and many are replete with discussions about deterrence models for South Asia. There are, however, some works on the India-Pakistan conflict and on the

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[26] Of all Indian political parties, the BJP is unique in having a permanent defence cell, which has studied various aspects of Indian defence policy. This cell is headed by Lt. General J.F.R.Jacob who is in the odd position of being a Jew in a party often accused of being domintated by Hindu fascists. The BJP is also unique in that it has consistently called for India to develop and deploy nuclear weapons.

changes in the internal policies of India which provide interesting insights into various aspects of South Asian security.

Sumit Ganguly's *The Origins of War in South Asia: Indo-Pakistani Conflicts since 1947* is the only book that provides a comparative study of the three India-Pakistan wars.[27] This work is significant because it explores the relevance of the colonial legacy and the numerous subnational factors, such as religion and ethnicity, to the causes of war in South Asia. Kanti Bajpai and Stephen Cohen provide a number of interesting perspectives on the post-Cold War South Asia in *South Asia after the Cold War: International Perspectives*.[28]

For a more detailed exploration of the changes in Indian policy, both in foreign affairs and defence, Shekar Gupta, writing in 1994 argued that India has moved away from the internationalist rhetoric that characterized the government of Jawaharlal Nehru and his successors and has adopted a policy that is guided by pragmatic concerns.[29] It can be argued that India's retention of its nuclear option is a continuation of this policy of pragmatism, since India's security concerns outweigh any utopian desire for disarmament. However, it can also be argued that this is a rejection of this pragmatic policy and represents a desire to display Indian martial prowess with very little benefit for India.

The Kashmir dispute has also generated some interesting literature in recent

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[27] S.Ganguly, The Origins of War in South Asia: Indo-Pakistani Conflicts since 1947 ( Boulder: Westview Press, 1994 )

[28] S.Cohen & K.Bajpai, ed. South Asia after the Cold War: International Perspectives ( Boulder: Westview Press, 1993 )

[29] S.Gupta, 'India Redefines its Role' Adelphi Paper 293 ( London: IISS, 1994 )

years. Raju G.C. Thomas in *Perspectives on Kashmir*, provided a number of fresh perspectives of the problem in relation to the incomplete process of state and identity formation in South Asia.[30] Robert G. Wirsing's *India, Pakistan and the Kashmir Dispute*, is one of the best policy oriented work on the Kashmir dispute,[31] while Major General Afsir Karim provided a interesting military analysis of the Kashmir problem as part of the Indian Defence Review Research Team's publication, *Kashmir: The Troubled Frontiers*.[32] This work is particularly significant because it goes into, with some detail, the state of human and economic development, the geographic ethnic and religious breakdown and the political developments in the region. Major General Karim's work also assesses the military and political options open to the Indian government for a resolution of the Kashmir disupte.

Interviews were both invaluable and difficult. Between mid-1994 and May 1998, the author has communicated with a number of Indian military officers and scientists. While they were more than willing to talk in detail about modernization programs, missile development and military tactics, many of them were extremely reluctant to allow any information disclosed to the author to be quoted in this thesis. Owing to the air of secrecy that pervades any security related matter in South Asia, this was fully anticipated by the author. In respect for their wishes, the author has limited the use of the information garnered in these communications to relatively minor items.

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[30] R.G.C.Thomas, Perspectives on Kashmir: The Roots of Conflict in South Asia ( Boulder: Westview Press, 1992 )

[31] R.G.Wirsing, India, Pakistan and the Kashmir Dispute, ( New York: St. Martin's Press, 1994 )

[32] Maj.Gen. A.Karim, B.Verma & M.Singh, ed. Kashmir: The Troubled Frontiers ( New Delhi: Lancer, 1994 )

The author decided on a policy of 'quality' over 'quantitiy' when dealing with interview sources. The author approached a mix of retired senior and middle-ranking officers in both the army and air force in addition to journalists and academics. Serving officers refused to answer any questions but a number of highly respected former officers were willing to meet, or correspond with, the author. The number of people interviewed may appear to be small, but between the seven military officers interviewed, the author came away with a very detailed insight into the Indian army and air force doctrines and force levels. A single retired scientist agreed to correspond with the author on the issue of passive defence against nuclear and chemical attack, but care was always taken to avoid direct discussion of nuclear weapons for security reasons.

In attempting to do interviews on this subject, the author had a glimpse into the world in which the military and scientific establishments of South Asia operate. Many would not speak about any security related matter over the telephone since these were routinely monitored. Others were refused to communicate via e-mail since their accounts were not secure. In fact, on more than one occasion the author was asked 'Who are you spying for ?' , and this was not always in jest. Since nuclear weapons are an extremely sensitive subject, it is wholly understandable that attempts from an outsider to obtain information on the subject would result in some suspicion.

Much more published information is forthcoming on Indian programs than on those of Pakistan. India has a lively strategic thinking community that regularly publishes its opinions. Moreover, on issues relating to the armed forces, Indian sources were a bit clearer regarding modernization programs. This thesis, therefore, does have a

slightly more detailed discussion of Indian programs and theories than on those of Pakistan.

Nuclear weapons have acquired a mystique all their own in South Asia and neither India nor Pakistan will move towards complete disarmament. However, in light of the current tensions between these two nations it is imperative that some understanding of how India and Pakistan intend to use nuclear weapons be reached. The costs of any nuclear exchange in South Asia will be staggering. However, war can only be averted by India and Pakistan talking to each other honestly on all issues - up to and including the nuclear issue.

**Postscript**:

In May 1998 India and Pakistan conducted a series of nuclear tests that brought the nuclear weaponization of South Asia into the open. As this thesis deals with period only up to April 1998, the main body of this thesis does not deal with the tests. However, since the tests have a direct impact on the subject of this thesis, an epilogue has been added in order to deal with the nuclear tests and their immediate aftermath.

## *Chapter One:* Perspectives on Nuclear Weapons in South Asian Security

Discussions about South Asian security are dominated by two issues - the issue of nuclear weapons and that of internal security. While these issues are very different in nature, they are in some ways linked since the quest for nuclear weapons in South Asia cannot be completely divorced from deteriorating internal security problems.

There is no doubt that India and Pakistan face severe internal security problems and have experienced considerable difficulty in dealing with them. However, it is also true that both countries see nuclear weapons as crucial to their national security and that both countries have embarked on a major build-up of both their nuclear capabilities conventional military forces. Since India and Pakistan, as will be shown later in this chapter, routinely blame each other for their internal security problems, the current preoccupation with counter-insurgency and counter-terrorist operations does not eliminate the possibility of either nuclear or conventional war in South Asia.

This chapter will explore a number of issues, including the place of nuclear weapons in the threat perceptions of the Indian and Pakistani ruling establishments and will show that in their thinking, the nuclear threat has not yet assumed a position of primary importance even though both countries continue to view each other as the principal potential nuclear adversary. An overview of the evolution of Indian and Pakistani defence policy, which defines the role of nuclear weapons is also included. The ability to inflict unacceptable ( and probably catastrophic ) damage on each other is seen as an ultimate guarantor of continued existence in the case of Pakistan and in the case of India is a safety-guard against nuclear blackmail from either China or Pakistan.

This chapter will also provide an overview of the internal security aspect of Indian and Pakistani security and will show that considerable assets are already being ploughed into this thankless task. The chapter will also deal briefly with the 1987 and 1990 crises between India and Pakistan and the role played by foreign powers in the nuclear and conventional arms build-up in the region.

After the bloody aftermath of their birth, both India and Pakistan have been almost obsessed with preserving their existence as independent states.[1] At one level, it seems that the two countries are still trying to justify their existence and have attached an extremely high priority to territorial integrity, hence India's passionate and determined efforts to keep its share of Kashmir under Indian control.[2]

This overwhelming concern about territorial integrity has shaped the military policies of both countries and this in part explains why India and Pakistan maintain two of the largest and most highly trained military establishments in the world. The political establishments in both countries, while appearing to be dithering and lacking direction at times, are deeply committed to the preservation of both India and Pakistan.

At the core of the India-Pakistan confrontation is a deep ideological divide between an India believing in a secular, multi-religious democracy and a Pakistan carved out solely for the Muslim of the Indian subcontinent. Kashmir, the disputed

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[1] For an excellent account of the scale of the violence witnessed during the 1947 partition of India and Pakistan, see L.Collins & D. Lapierre, Freedom and Midnight ( London: Pan Books Ltd.,1977 )

[2] The Indian obsession with national survival and territorial integrity is demonstrated in the frequent references by political leaders from all parts of the country about the necessity for the preservation of India's territorial integrity. See also M.Tully & Z.Masani, From Raj to Rajiv ( New Delhi: Universal Book Stall, 1989 )

territory, has come to symbolize this divide.[3] For Pakistan, Kashmir is a Muslim population under infidel domination and should be rightfully part of Pakistan.[4] For India, Kashmir symbolizes its secular identity where a Muslim population exists as equal citizens with their compatriots from all religions.[5]

Pakistan has feared that India has never really accepted its right to exist as an independent entity. It has a constant fear of an Indian attack and as such has sought to build up military forces to safeguard its sovereignty. India has, of course, followed suit and built up large and powerful military forces of its own.. This has led to a downward spiral of deepening distrust, higher military expenditure and what seems to be a conditioned response by one country to the arms acquisitions of the other.

Threat perceptions in Pakistan and the Role of Nuclear Weapons

For Pakistan, faced with the massive Indian population, economy and military potential, nuclear weapons are seen, quite literally, as the sole guarantee of Pakistan's continued existence. While India may at times portray itself as an adherent to Mohandas Gandhi's policy of non-violence, Pakistan sees an India that possess a highly developed nuclear capability and a large and capable conventional military force which are directed

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[3] India's commitment to the principles of secularism and democracy stem from creation, since Independence in 1947, of institutions aimed at preserving democracy and from the drafting of a Constitution based on liberal democratic values. See J.M. Brown, Modern India: The Origins of an Asian Democracy ( New York: Oxford University Press, 1991 )

[4] P.Spear, A History of India: Volume 2 ( London: Penguin Books, 1990 ) ,pp.241-242. This gives a concise account of the Kashmir situation in 1947, where a Hindu ruler presided over a Muslim majority state and acceded to India rather than Pakistan.

[5] It is probable that Jawaharlal Nehru's Kashmiri origins also played a role in India's desire to retain Kashmir. See also, Collins & Lappierre, Freedom at Midnight, p.407.

against the Pakistani state.

Pakistan believes ( though reality may be somewhat different ) that India fully intended to destroy Pakistan utterly in the 1965 and 1971, wars and was extremely alarmed by the expansion and modernization of the Indian armed forces during the 1980s.[6] Exercise 'Brasstacks' with its potential for the bisection of Pakistan did nothing to assuage these fears. The bitter defeat of 1971 still looms large in Pakistan's military psyche.[7]

As the 1980s progressed, Pakistan became increasingly aware of its inability to physically match India's conventional forces in numbers and was also worried about the increasing sophistication of the Indian armed forces. The nuclear option was therefore developed as a weapon of last resort to be used in the event of major Indian gains on the battlefield. Therefore, since the mid-1970s - immediately after the Indian atomic test - Pakistan has actively pursued a clandestine nuclear weapons program that came to fruition in the mid-1980s.[8]

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[6] For an excellent account of Indian military objectives in both the 1965 and 1971 wars see Maj.General S.Singh, India's Wars Since Independence: Defence of the Western Border ( New Delhi: Vikas Publishing House, 1981 ) This book clearly states that India had very limited war aims in both 1965 and 1971.
For a Pakistani perspective see Air Marshal A.Khan, The First Round, ( New Delhi: Vikas Publishing House, 1969 )
See also S.Salik, Witness to Surrender ( New Delhi: Oxford University Press, 1979 )

[7] Until recently, Pakistan's military officers had to swear that they would avenge the 1971 humiliation. It is not known if this practice continues.

[8] The Pakistani nuclear program started in 1972 - see Chapter Two

Threat perceptions in India and the Role of Nuclear Weapons

Central to India's security is the fact that it is bordered by two countries with which it has serious border disputes. India has a volatile border with Pakistan and is wrestling with a Pakistani sponsored insurgency in India's part of the disputed Kashmir region. With China, the border dispute is not nearly as serious, though there is mutual distrust between the two countries and a substantial Indian troop presence has been maintained along the Sino-Indian border since the two countries fought a short but vicious war in 1962.[9]

India has arranged its conventional and non-conventional forces to deal with perceived threats from both Pakistan and China.The bulk of India's forces are arrayed against Pakistan, but a substantial troop presence is manitained against China.[10] The Sino-Pakistan strategic partnership has created significant concern in India since China has had few qualms about selling Pakistan missile technology and has possibly supplied Pakistan with reliable designs for atomic weapons.[11] It is the perceived threat of the Sino-Pakistan nexus that prompted India to continue with the development of its nuclear

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[9] Compared to the India-Pakistan border, the Sino-Indian border is a zone of tranquility. Daily artillery and machine gun duels errupt along the Line of Control in Kashmir, while along the Sino-Indian border, the biggest problem is the smuggling of contraband goods. This was discussed with Lt. General 'G' in an interview with the author on 25 March 1998 in New Delhi.

[10] Interviews with Mr.'C' between March 1996/April 1997 in London and New Delhi. A breakdown of the Indian army is given in Chapter Four. India maintains 6.5 divisions along the China border in peacetime. This can be doubled to 13 divisions in the event of war with China alongside large numbers of special forces and paramilitary troops. While the Sino-Indian border is not as tense as the India-Pakistan border, the author was informed that Indian does not consider this to be a permanent state of affairs and remains wary of Chinese intentions.

[11] In Chapter Three, China's involvement in selling M-11 missiles and manufacturing technology to Pakistan is discussed.

weapons capability and initiate work into ballistic missiles.[12]

China is an established nuclear power, having detonated a nuclear weapon in 1964. This provided the initial impetus to the Indian nuclear program - as is discussed later - and is still used as the primary justification for the 'Agni' Intermediate Range Ballistic Missile program.[13] Though India and China have not gone to war since 1962, and although India has dramatically improved its conventional military position against China, to the extent where India holds air superiority and virtually numerical parity in the Sino-Indian theatre, India still remains suspicious of Chinese intentions and perceives itself to be at least at a peripheral threat from Chinese nuclear weapons.

With regards to Pakistan, the situation is somewhat different. Two major wars were fought, first in 1965 and then in 1971 where India scored a major victory over Pakistan's forces in what was then East Pakistan, but in neither war was India able to, nor did it really try to, decisively defeat Pakistan in the West. [14]

Nuclear weapons became a major part of the India-Pakistan equation during the Winter of 1986/1987.[15] India long believed, with some justification, that Pakistan was, and still is, fomenting terrorism and insurgency in India since the mid-1980s. This was

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[12] This was the view of Lt. General 'G' in an interview with the author on 25 March 1998

[13] According to Lt. General 'G', India seems to think of China as a long term threat and believes that nuclear weapons and delivery systems need to be developed to counter this threat. Interview with Lt.General 'G' - 25 March 1998. This was also the view of Mr.'C' - interviews between March 1996 & April 1997 and Air Marshal 'E' - interview in March 1998.

[14] See Lt.General S.Singh, India's Wars Since Independence: The Liberation of Bangladesh & The Defence of the Western Border ( New Delhi: Vikas Publishing House, 1981 )

[15] Details of this come in Chapter Two

particularly the case in Punjab, though there were some signs in the late-1980s of the emergence of the Kashmir insurgency. India believed that Pakistan soughtt the balkanization of India, or at the very least, to create such internal turmoil in India so as to facilitate a Pakistani territorial grab in Kashmir.[16] This was, and is still, used to justify the existence and continual modernization of India's huge conventional military forces.

The Indian conventional forces outnumber their Pakistani counterparts by a substantial margin.[17] Moreover,. India also began experimenting with new tactics involving the use of massed armour and mechanized infantry formations and in 1986-87, conducted a series of military exercises that would facilitate the bisection of Pakistan. In response to this, Pakistan brought itself to the verge of nuclear weaponization so as to deter India. This, in turn, sparked a resurrection of India's own nuclear weapons program so as to prevent any nuclear blackmail on the part of Pakistan.

The India-Pakistan nuclear race that started more than a decade ago has acquired a momentum all of its own with neither country trusting the other sufficiently to give up its nuclear option. Although China was the principal reason for India initiating a nuclear weapons program, Pakistan has now overtaken China in India's nuclear and conventional threat perceptions owing to the rise in cross-border terrorism and tension over Kashmir. In fact, India has not vigorously pursued its nuclear deterrent against China as can be seen from the leisurely pace of the 'Agni' IRBM program and the slow

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[16] India sees the hand of Pakistan's 'infamous' Inter-Services Intelligence (ISI) behind almost all terrorist attacks in India. Recent operations in Kashmir have captured a number of ISI trained Afghan 'mujaheddin' - interviews with Mr.'C' in January 1998

[17] Chapter Four provides details of the Indian and Pakistani armed forces.

pace of the nuclear weapons program immediately after the 1974 atomic test. However, the nuclear program and the 'Prithvi' missile program have been accorded a high priority for possible use against Pakistan.[18]

So where do nuclear weapons fit into India's threat perceptions ? India views nuclear weapons as an ultimate deterrent against both conventional military threats and the fear of balkanization from domestic insurgency sponsored by foreign powers as well as providing a deterrent against nuclear attack.[19] In one way, nuclear weapons are very much a part of India's internal security apparatus. This does not mean that India would use a nuclear weapon against an insurgent group. Rather it serves to warn foreign powers - namely Pakistan and China - that India could, and would, inflict unacceptable damage on them should they attempt to balkanize India.

## The Evolution of India's Defence Policy

The creation of a defence policy for an independent India dates back to 1945 when the British colonial authorities in India began demobilising the 2.5 million strong Indian army of the Second World War. Most British and Indian military writers and analysts argued that a regional approach to Indian security should be adopted.[20] One proposal was for India to form the nucleus of a regional Commonwealth force. These

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[18] See Chapter Three - section dealing with the Indian missile program

[19] This was revealed to the author in an interview with Lt.General 'G' on 25 May 1998

[20] L.J.Kavic, India's Quest for Security, ( London: University of Cambridge Press, 1967 ),p.19 For a concise, yet detailed account of the Indian army during the period 1945-1947, see C.C.Trench, The Indian Army and the King's Enemies: 1900-1947 ( London: Thames & Hudson, 1988 )This book provides details on the expanison of the Indian army in World War 2, its combat record and on its post-war demobilization.

proposals led to a re-assessment of the required size and strength of the armed forces.

The Indian army was to be reduced from a size of 2.5 million to about ten infantry divisions, an armoured division, an airborne division, fifty frontier-defence battalions and sixty-three internal security battalions.[21] The Indian navy was to be built around a nucleus of three cruisers and the Indian air-force was to be doubled to a strength of twenty squadrons.[22] This plan came to nought because of the turbulence in the Indian subcontinent. The armed forces were forced to commit themselves to the difficult task of protecting refugees and establishing relief camps. Moreover, the partition of British India into India and Pakistan had a direct impact on the Indian armed forces which were divided between India and Pakistan in the ratio 2:1, effectively ending any attempts to initiate the reorganization plan mentioned above . India's share amounted to 280,000 men in an army of four infantry divisions with some artillery and armour; a navy of 11,000 personnel with four sloops, two frigates and one corvette, and an air-force of seven fighter squadrons and a single transport squadron.[23]

The new Indian government, led by Jawaharlal Nehru, was unfamiliar with defence issues. Nehru, along with much of the leadership of the Indian National

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[21] ibid p.20 & p.239

[22] loc.cit. Kavic's work represents an extremely concise, but interesting account of the Indian military's immediate post-independence period. Kavic's work, though dating from 1967, is one of the few which deals with defence policy as well as the armed forces.
There are a number of other more detailed accounts, some of them being written in the 1960s and 1970s. Many of these, however deal with the 1962 Sino-Indian war and not,as such with the post-independence Indian military.
See: Lt.General S.L.Menezes, The Indian Army, ( New Delhi: Viking, 1993 )
Maj.General D.K Palit, War in High Himalaya, (London: C.Hurst & Co.1991)
Lt.General L.P.Sen, Slender was the Thread (Hyderabad: Orient Longman 1969)
Air Chief Marshal P.C.Lal, My years with the IAF ( New Delhi: Lancer, 1986 )

[23] Kavic, India's Quest for Security, p.41

Congress, had spent much of the Second World War in prison and played no role in formulating defence policy.[24] As a result, Indian defence policy in the post-war period was formulated by an inexperienced government.

After independence, Prime Minister Nehru argued that India's peace and security could not be insured through alliance systems and military expansion.[25] Instead, Nehru proposed to build India's defence and foreign policies around the five principles of 'Panchseel'. These five principles of peaceful co-existence with communist states were first embodied in the Sino-Indian Treaty of 1954 as Nehru's government was keen to establish good relations with China.

India's policy of non-alignment had serious consequences for the Indian armed forces. The Indian military, unlike their Pakistani counterparts, was unable to obtain significant United States military aid because of India's friendship with communist countries. A rather more serious effect of the 'Panchsheel' policy was that India's border with China was not adequately defended. While there was the purchase of some new equipment, there was no expansion of the Indian armed forces and defence budgets for essential maintenance and war wastage reserves were often savagely cut.[26]

India and Pakistan had fought a war over the disputed Kashmir region between

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[24] In fact, the Indian government requested that the former Viceroy - Lord Louis Mountbatten - become Governor-General immediately after independence to lend his military expertise so that effective convoys for refugees could be organized. Even this task was beyond the existing expertise of the new Indian government. See Collins & Lapierre, Freedom at Midnight,pp.363-366

[25] R.G.C.Thomas, 'The Growth of India's Military Power',p.39 in R.Babbage & S.Gordon ed.,India's Strategic Future (London: MacMillan, 1992)

[26] Some new fighter aircraft and 250 Centurion tanks were purchased in the 1950s. For a useful summary of Indian military procurements in the 1950s and 1960s, see C.Smith, India's Ad Hoc Arsenal ( New York: Oxford University Press, 1994 )

1947 and 1949. As a result, almost all of India's combat units and military infrastructure were designed to meet the Pakistani threat. India's defence plans assumed that Pakistan would initiate action in Kashmir, leading to an Indian counter-attack along other fronts. The Indian army was to concentrate its full strength against Pakistan, to defeat the Pakistani army and, if necessary, to occupy or destroy the Pakistani cities of Lahore and Sialkot.[27]

The possible threat from the People's Republic of China was deliberately downplayed by the Indian government which was attempting to forge a friendly relationship with the then quasi-pariah communist regime. In fact, army units in Eastern India were either deployed for counter-insurgency duties in the troubled North-Eastern States or for the defence of Calcutta. The defence of the China border was entrusted to the lightly armed personnel of the Central Reserve Police Force.[28] Artillery and logistical support was non-existent and communications, both by radio and by road, were precarious at best. There were a number of air-force bases located in the vicinity of the North-Eastern border with China, but these lacked infrastructure and few combat aircraft were based at these locations.[29]

The Sino-Indian border war of 1962 came as a shock to the Indian government, though not really to the Indian military. Along the North-East frontier, Indian forces were defeated after a number of incorrect command decisions and the induction of poorly equipped reinforcements, none of whom were properly acclimatized, did nothing

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[27] Kavic, India's Quest for Security, p.37

[28] ibid.p.87

[29] Interview with Mr.'F' - 23 March 1998

to halt the Chinese advance. The government had earlier ignored demands by the army for the creation of dedicated mountain divisions and the building of suitable infrastructure to allow for a successful defence of the border with China.[30]

The exception to this general trend of humiliating defeats was the situation in Ladakh. Here, an army brigade had been in position since 1959 and had devised a reasonably effective layered defence plan. Though some tactical withdrawals to secondary defensive positions occurred, Indian forces remained cohesive and effective combat units in the Ladakh sector.[31]

The aftermath of the humiliating defeat suffered by India in this short but sharp border war saw a major reassessment of India's defence policy. The Indian government recognized that it had to contend with both Pakistani and Chinese military threats and, as such, troops, equipment, defence plans and an effective defence policy had to be provided to deal adequately with the new strategic environment. This has remained the cornerstone of Indian defence policy ever since, the dual threats from Pakistan and China constantly being cited by the Indian leadership, though China is perceived to be a much less likely adversary. Moreover, one of the reasons for the massive military reorganization and modernization program that ensued was to ensure that the Indian government and its politicians would not have to face the fury of the Indian public, which was of course also the electorate, if another military defeat occurred.

The post war period saw a dramatic increase in size and capability of the Indian

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[30] Kavic, India's Quest for Security, p.96

[31] ibid p.176

armed forces. Although the expansion was comprehensive, it was still essentially defensive. The thrust of Indian defence policy was revolved around what R.G.C.Thomas calls the 'minimalist' perspective of being able to fight one 'full' war and one 'half' war. [32] In military terms, this means that India was capable of fighting a war on land, sea and in the air against Pakistan while being able to fight a defensive border war with China.

Unlike the situation in the 1980s and 1990s, China was seen as ultimately the most significant threat throughout the 1960s and 1970s, and although the 1965 and 1971 wars with Pakistan proved that the Pakistani forces were still a substantial adversary, India's leadership viewed China's increasing power with growing concern. To this end, despite the substantial growth in India's naval capability and a widening gap in Indian air superiority, India has still confined itself to being able to fight a full-scale offensive war with Pakistan, while deploying sufficient forces to fight only a defensive war against China.

Even the growth in India's nuclear and missile capability, which has now reached the stage where India has a considerable ballistic missile potential and a large stock of fissile material, has to be seen in light of the fact that there has been no perceptible change in India's basic strategy versus China and Pakistan. Nuclear weapons are an extension of this 'one and a half' wars capability. No meaningful power projection doctrine has yet emerged in India.

R.G.C.Thomas believes that India has moved on from this position to one where India has the capacity to fight 'one full and three half' wars. This means that India would

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[32] Thomas, 'Growth of Indian Military Power', p.43

be able to conduct a full war with Pakistan, conduct a defensive border war with China, combined with a latent nuclear weapons capability and the ability to intervene in neighbouring Indian Ocean islands.[33] This may be considered to be India's current strategic position. India may eventually deploy IRBMs and perhaps ICBMs openly, however, there seems to be no evidence of India shifting its basic threat perceptions in the near future. Pakistan and, to a lesser extent China, remain, in the view of the Indian government, the two major military threats faced by India and to this end, substantial conventional forces and a significant nuclear potential are seen to be vital to preserving India's ability to deter an attack from either country.

India has not yet attempted to deploy nuclear weapons in an attempt to give itself a higher profile - much to the chagrin India's vociferous pro-'bomb' lobby. However, the fact that India is a de-facto nuclear power ( of a sort at least ) needs to be taken into account by all foreign powers. As far as power projection is concerned, India is already the dominant power in South Asia and nuclear weapons merely serve to emphasize that point rather that carve out a new role for India. China and Japan are the major powers in East Asia and South East Asia, and India, even with nuclear weapons, would not really be able to assert its pre-eminence in these regions.

## The Evolution of Pakistan's Defence Policy

Pakistan, unlike India, has only one major adversary - India. Since its inception, Pakistan has dedicated its defence policy to dealing with India by both conventional and

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[33] ibid.p.43-45

non-conventional means. To this end, Pakistan has a well developed military establishment with a highly professional army and an increasingly capable nuclear weapons production base.

In the first decade after independence, Pakistan, like India, depended on the United Kingdom for its arms supplies. However, In 1954, Pakistan began a long and fruitful military relationship with the United States. In May 1954, Pakistan signed a Mutual Defence Assistance Agreement with the United States.[34] This led to a substantial influx of modern American weaponry into the Pakistani army and air force and to the eventual acquisition of Pakistan's ( and South Asia's ) first submarine.[35]

Pakistan's desire to incorporate the region of Kashmir has remained an important cornerstone of Pakistani defence policy since 1947.[36] In 1947-49, 1965 and from the late 1980s, Pakistan has attempted to wrest control of the state from India by means of fomenting armed insurrection against Indian rule.[37]

In 1965, India and Pakistan clashed along their entire border in an inconclusive conflict that was marked by tactical conservatism.[38] The war ended with heavy losses to the Pakistani side in terms of both men and material, however, the good performance of

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[34] I.Anthony, The Arms Trade and Medium Powers: Case Studies of India and Pakistan 1947-1990 ( Hemel Hempstead, Hertfordshire: Harvester Wheatsheaf, 1992 )p.71

[35] ibid pp.195-200

[36] Kashmir, with a Muslim majority, technically should have gone to Pakistan at the time of partition. However, the region's Hindu ruler - after an invasion by Pakistani supported Pathan tribesmen - acceeded to India.

[37] While Pakistan continues to deny supplying arms to Kashmiri terrorist groups, there is substantial proof of Pakistani involvement upto and including the supply of weapons and the provision of training facilities

[38] See Lt.General H.Singh, War Despatches: Indo-Pak Conflict 1965 ( New Delhi: Lancer, 1991 )

the army and air force led many in the Pakistani government to treat this unfavourable stalemate as a victory.[39]

In 1971, however, there was no doubt about the outcome. Pakistan lost one half of its territory and population along with large numbers of men and substantial quantities of equipment in a war that lasted only two weeks.[40] Pakistan's humiliation was further compounded by the fact that neither the United States nor China was able to prevent the loss of East Pakistan and the creation of Bangladesh.

Out of this humiliation, and now forced to face the might of the Indian war machine along a single border, Pakistan realised the need for a nuclear deterrent and so the 1971 war with India led directly to the Pakistani nuclear weapons program. Since the 1971 war, Pakistan appears to have concentrated on matching India at the operational level in terms of conventional military forces, maintaining a nuclear deterrent against a full-scale Indian offensive while seeking to pursue its objectives in Kashmir by means of a proxy war.[41]

Pakistan has one other major security concern - Afghanistan.[42] The turmoil that has plagued Afghanistan has led to an influx of refugees into Pakistan as well as to

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[39] The Pakistani Air Force, in particular, has created many myths about its performance in the 1965 war with India. One Indian air historian has argued that this was partly responsible for Pakistani overconfidence in facing India in 1971. Interview with Mr.'F' in March 1998

[40] See Major K.C. Praval, The Indian Army after Independence, ( New Delhi: Lancer, 1993 ) for an excellent account of the war

[41] There is a greater discussion of Operational Parity after Chapter Five.

[42] The author would like to differentiate between a 'security threat' and a 'security concern'. Pakistan feels threatened by India's military forces. In the case of Afghanistan, Pakistan is not threatened in the physical sense, but remains concerned about the turmoil on its northern border.

clashes along the Afghan-Pakistan border. However, with the rise of the Pakistani backed Taliban militia and their recent success, Pakistan must view Afghanistan with some satisfaction.[43]

The relationship Pakistan has had with the United States has enabled Pakistan to procure a number of sophisticated weapons systems, including F-16 fighters. However, it is China that has provided Pakistan with the bulk of its conventional weapons and weapons technology.[44] This has enabled Pakistan to maintain military forces capable of providing a substantial defence in the event of an Indian offensive.

In the mid-1980s, as will be discussed in the next chapter, Pakistan achieved what might be termed an 'initial operational capability' with its nuclear deterrent. This effectively limited any kind of conventional military response that India could mount to deal with Pakistani support for insurgent groups within India.

Pakistan has continued to support subversive activity in India, in spite of its vigorous claims to the contrary.[45] First in Punjab and now in Kashmir, Pakistan has succeeded in tying down a sizeable number of Indian troops, though perhaps not as many as Pakistan might claim.[46] Moreover, Pakistan has succeeded in alienating a large section of the Kashmiri muslim population from the Indian government. However, India

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[43] The rise of the Taliban has been meteoric. See BBC World Service reports 1996-1998 at http://www.bbc.co.uk

[44] Anthony, Arms Trade and Medium Powers, pp.195-200

[45] The author has seen some photographic evidence of tangible Pakistani support for terrorist activity in India.

[46] Pakistan has,on occassion, alleged that 600,000 Indian troops are in Kashmir. The actual figure is closer to 250-300,000 and most of these are not assigned to counter-insurgency duties. This was revealed to the author in interviews with Mr.'C' between May 1996 and February 1998.

has shown no inclination to relinquish its claim to Kashmir any more than has Pakistan.

Internal security concerns

It is well known that both India and Pakistan have quite severe internal security problems. India faces serious problems in its North Eastern States and in Kashmir and experiences some turmoil in states such as Bihar. Pakistan, on the other hand, faces major problems in its Sindh province and its North Western frontier is virtually ungovernable. It is outside the scope of this thesis to go into any detail on the internal security problems of India and Pakistan, even though there is a link between internal security and nuclear weapons. This section will give an outline of the considerable manpower and effort being used by these two countries to control their internal security.[47]

India deploys paramilitary internal security forces numbering close to a million men under arms. While these forces are all armed, with a mixture of obsolete and relatively modern small arms, their standards of training and operations is very variable. Some forces, such as the Assam Rifles, the Border Security Force and the Indo-Tibetan Border Police, are very well equipped and, in the case of the Indo-Tibetan Border Police and, to a lesser extent, the Assam Rifles, are highly trained. The Border Security Force, which is the world's largest paramilitary force, is reasonably well trained and has a fairly impressive combat record - although is guilty of numerous human rights violations in

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[47] For an excellent summary of India's internal security forces see R.G.C.Thomas, Indian Security Policy ( Princeton: Princeton University Press, 1986 )pp.72-85

Kashmir.[48]

Other forces, such as the Central Reserve Police Force and the State Police commandos, are equipped with modern small arms and regarded as being quite effective by the Indian public.[49] However, the State Police forces, which deploy four hundred thousand paramilitary personnel and over a million police personnel, are poorly equipped and have a very variable, though usually poor, standard of training.[50]

Despite these forces being available, and because of the inadequacies of the police forces, over a hundred thousand army personnel were deployed on internal security operations of one kind or another. This presents a substantial drain on the Indian defence budget and has led to problems of morale amongst the troops deployed on these operations.[51] The creation and deployment of a new force, the Rashtriya Rifles - which replaced over a third of the army personnel on internal security functions - has not proved to be as effective as hoped.[52]

Pakistan's army has not been deployed as widely or as frequently for internal security duties, however they did spend several years unsuccessfully attempting to

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[48] The BSF has a strength of 185,000 see: Govt.of India Ministry of Home Affairs Annual Report 1996-97, p.28

[49] The Assam Rifles, Indo-Tibetan Border Police, Border Security Force, CRPF and police commandos carry weapons similar to those used by the Indian army. These include 7.62mm self-loading rifles and machine guns and some mortars. The BSF has 20 artillery groups with old artillery pieces phased out of regular army service.

[50] The Indian police carry a mix of 0.303 bolt action rifles and aging submachine guns. Some light machine guns are also available. Some progress has been made with regards to issuing self-loading rifles to State Police forces.

[51] Interviews with Mr.'C'- March 1998

[52] There is a move to replace the Rashtriya Rifles with a dedicated COIN force equipped and trained to army standards with dedicated COIN officers. Interview with Mr.'C' - January 1998

restore order in Karachi.[53] Pakistan's police forces, which are better equipped (although not necessarily better trained), than their Indian counterparts, have been even more unsuccessful in maintaining law and order in whole swathes of the Sindh and Punjab provinces.[54] The difference between India and Pakistan is that violence in many areas of Pakistan is associated more with organized crime, while in India, numerous ethnic and religious factors come to play.

Both India and Pakistan must therefore maintain, at great expense, substantial paramilitary forces that are used almost exclusively for internal security operations. India's internal security forces have been stretched to their limits as India's beleaguered police forces have found themselves incapable of dealing with frequent terrorist attacks or counter-insurgency operations.[55]In Pakistan, the internal security forces are caught in what seems to be an unwinable battle. They face terrorists, narcotics traffickers as well as the private armies of the various political and criminal factions in the country.[56]

Neither country is in any immediate danger of disintegration, but the internal security issue does create an air of insecurity that does not help build trust between the two nations. When this is combined with the fact that the two countries routinely blame

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[53] The author was told that the Pakistani army unilaterally decided to withdraw from Karachi. Interviews with Mr.'C' - Jan./March 1997

[54] Pakistan also deployed its paramilitary Rangers in Karachi. These are still performing internal security duties in the city with mixed results.

[55] Some Indian paramilitary units have been airlifted from one part of the country to the other as many as 33 times in a single year. This creates a substantial morale problem in the battalions of the paramilitary forces. Interview with Lt.General'G' - March 1998

[56] In Pakistan, the availability of sophisticated firearms to the general public is frightening. The author has seen photographs of women and children in Karachi toting assault rifles.

each others' intelligence agencies ( with some truth ) for terrorist attacks, and the extent of the problem becomes distressingly clear. This lack of trust and the environment of mutual suspicion that this encourages provide the basis for an unstable security situation in South Asia.

## The Introduction of Nuclear Weapons into the India-Pakistan equation

While India tested a nuclear device in 1974, nuclear weapons did not really enter the India-Pakistan security equation until after what appears to have been a major crisis in the winter of 1986-87. This crisis, which followed a series of massive Indian military manoeuvres, apparently brought both countries to the brink of war. It is not the purpose or intention of this thesis to explain 'Brasstacks' and the crisis that evolved around it in any great detail. However, it is useful to examine many aspects of the incident , including the confusion and developments that resulted in the crisis.[57]

In the mid-1980s, the Indian army began a program to increase its mechanised formations and to integrate armour, artillery and mechanised infantry into powerful striking forces capable of overpowering their Pakistani opponents. The exercise held in 1986-87 was codenamed 'Brasstacks' and was the largest series of exercises ever held in South Asia, involving up to 150,000 troops.

What sparked concern in Pakistan was not so much the size and scale of the exercises ( though there was significant concern about this as well ), but their location.

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[57] An extremely detailed account of the 'Brasstacks' crisis can be found in K.Bajpai, P.Chari, P.Cheema, S.Cohen & S.Ganguly, Brasstacks and Beyond: Perception and Management of Crisis in South Asia (New Delhi: Manohar, 1995)

'Brasstacks' was held east of the Indira Gandhi Canal in Rajasthan.[58] At the time, this corresponded with new military thinking in the Indian army which held that Punjab, unlike in 1965 and 1971, would no longer be the chief theatre of operations.[59] India sought to adopt a defensive posture in Punjab and in Jammu and Kashmir and take advantage of India's qualitative and quantitative superiority in armour in the Rajasthan-Sind general area. India believed that Pakistan would not be unduly concerned by the scale of 'Brasstacks' since a massive engineering operation would be needed to cross the Indira Gandhi Canal. However, Pakistan was increasingly worried since it was extremely sensitive to the threat of being bisected by an Indian offensive launched from this general area. Given the prevailing mistrust between the two countries and the sensitivity of the exercise area with respect to its proximity to the India-Pakistan border, it would have been expected that lines of communication between the civil and military leaderships in both countries would be kept open. This was not done.[60]

The Director Generals of Military Operations ( DGMOs ) of India and Pakistan are linked with a 'hotline', however, little information came from the Indian DGMO to his Pakistani counterpart and this served to significantly highten tensions.[61] The Pakistanis were particularly concerned about reports that Indian troops were carrying first and second line *live* ammunition on the exercise. When asked, the Indian DGMO

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[58] Bajpai, Cheema, Cohen,Chari & Ganguly, Brasstacks and Beyond, p.25

[59] This was due to the construction of a system of linear defences in the Punjab sector. This is dealt with in more detail in Chapter 4.

[60] Lt.Gen.A.M.Vohra,'Lessons of Border Tension'in *The Tribune*:11Feb.1987

[61] Bajpai,Cheema,Chari,Cohen & Ganguly, Brasstacks and Beyond, p.54

professed ignorance about this fact.[62] Pakistan's requests for information on the exercise were met, in September and October 1986, with curt and evasive answers from Indian Army Headquarters.[63] Naturally enough, Pakistan became increasingly suspicious of Indian intentions.[64]

The Pakistanis responded with a series of countermoves that saw Army Reserve North (ARN) and Army Reserve South (ARS ) deploying. These deployments theoretically enabled Pakistan to either capture a salient in Punjab or to attack Jammu and Punjab simultaneously.[65] After some initial hesitation, India ordered its troops to man forward defensive positions and the two countries stood on the brink of war. However, after a hectic round of diplomatic activity, which saw American and Soviet moves to diffuse the crisis, both India and Pakistan began a phased withdrawal from the border areas.[66]

The relevance of the 1986-87 events to this thesis really lie in the impetus that the 'Brasstacks' crisis gave to the Pakistani nuclear program. It was soon after this crisis that Dr.A.Q.Khan in an interview with *The Observer* of London, admitted that Pakistan was in possession of a nuclear weapon and was making enriched uranium at the Kahuta uranium enrichment plant.[67] Soon after this interview, questions were raised in the

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[62] ibid p.55

[63] ibid p.54

[64] The somewhat aggressive personality of India's Chief of Army Staff, General Krishnaswamy Sundarji, did not help matters.

[65] Chari,Cheema,Cohen,Bajpai & Ganguly, Brasstacks and Beyond,p.32

[66] ibid pp33-36

[67] *United Press International:* February 28 1987

Indian parliament about Dr.Khan's statement and demands were made for a reconsideration of India's nuclear policy.[68] Shortly after, *Reuters* news agency reported that Dr.Khan had told Indian journalist Kuldip Nayar that Pakistan did not need to conduct a 'ground test' since testing could be done through simulations in a laboratory.[69] These statements and the subsequent Indian reaction, brought nuclear weapons into the South Asian conflict.

One issue that arises out of the 'Brasstacks' crisis is that of Indian army operational planning. The 'Brasstacks' plan has been used as the basis for numerous war scenarios, including those conjured up by the vaunted American RAND corporation.[70] This is extremely misleading. The Indian army no longer believes the 'Brasstacks' model to be a realistic operational plan and with the demise of General Sundarji's 'Army Plan 2000', the Indian army has concentrated its efforts on being able to inflict heavy attrition on Pakistan's armed forces rather than on seeking any major territorial gain.[71]

Western and Indian analysts continue to refer to 'Army Plan 2000' and its operational doctrine, partly because it was extremely well publicized, and also because it

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[68] A.Tarnowski, *Reuters Ltd.*: March 1 1987

[69] R.Bajpai, *Reuters Ltd.*: March 2 1987

[70] This is exemplified in A.J.Tellis, Stability in South Asia, (Santa Monica: RAND, 1997). This is one of the worst assessments of the South Asian military that the author has ever read. Much of it is based on press reports on the state of the Indian military during the 1991-1992 period. No attempt seems to have been made to update information. When the author conducted independent research on the true state of the Indian army and air force, a very different picture emerged.

[71] This will be discussed in more detail in Chapter Four

represents a 'hi-tech' mechanised method of warfare that is appealing to journalists.[72] The fact is that the possession of nuclear weapons by Pakistan has severely curtailed Indian objectives. Should Pakistan feel that it is at risk of being bisected or otherwise dismembered, there is no doubt in the minds of Indian planners that Pakistan would consider the use of nuclear weapons.[73] Indian operations, therefore, have had to be planned with this in mind.[74]

As mentioned before, the 'Brasstacks' crisis brought the nuclear factor into the India-Pakistan equation. In 1990, however, another crisis erupted over Pakistani support to Kashmiri terrorist groups. Different versions of the events that followed are given. One scenario described by journalist Seymour Hersh, talks of Pakistani F-16s being armed with nuclear weapons and ready for launch against India.[75] Others assert that there was no crisis at all in 1990 and that the mistakes of 1987 were not repeated. [76] The author has noticed that Indian analysts tend to be of the view that no crisis occured in

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[72] The RAND report mentioned in footnote 32 is particularly bad in this regard. The report, which was prepared for the United States Army, does not mention the fact that 'Army Plan 2000' has been abandoned and bases all its conventional war scenarios on this obsolete model.

[73] Interviews with Mr.'C' -April/September 1997 and Lt.General 'G'-March 1998

[74] Army Plan 2000 was therefore irrelevant. Moreover, the plan was also viewed as fundamentally unworkable. The author spoke to several Indian officers in 1996 and 1998 and it was said that the plan was far too costly and was unrealistic in several regards.

[75] S.Hersh, 'On the Nuclear Edge' pp.56-73 - *The New Yorker*: March 29 1993. Hersh based his article entirely on an interview with a former deputy-director of the Central Intelligence Agency (CIA). The report seemed to suggest that nuclear war was only averted by American intervention. The piece was fascinating reading, but sorely lacking in evidence.

[76] See Bajpai,Chari,Cheema,Cohen & Ganguly, Brasstacks and Beyond, pp.133-134

1990, while American journalists such as Seymour Hersh, seem to believe otherwise.[77]

What the crisis of 1987 and the events of 1990 suggest is that both countries are aware of each others' nuclear capabilities and that they are reluctant to pursue military objectives that would spark a nuclear response from the other. However, the two incidents also illustrate the extremely high degree of tension between India and Pakistan.

In addition, these two incidents also indicate that there is an atmosphere of considerable mistrust and suspicion between the political and military elites of both countries. That an Indian military exercise almost led to a war in 1987 is both frightening and not wholly unexpected. So long as the two countries are reluctant to share the information necessary for reducing the level of mistrust between their political and military elites, it is not inconceivable that a repetition of the 'Brasstacks' crisis could occur.

Foreign Involvement - 'Blind Eyes' and the Limits of Influence

Indian and Pakistan nuclearized in front of the whole world. By a combination of neglecting legitimate security concerns and by turning 'blind-eyes', the influence of several foreign powers has been severely curtailed and their credibility damaged.

Through much of the Cold War, the Soviet Union was a supporter of India, while the United States and China supported Pakistan. As mentioned earlier, the United States and China provided, and continue to provide, Pakistan with substantial quantities of

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[77] The author has learnt that in 1990 neither India nor Pakistan were in any position to go to war. Interviews with Mr.'C' - Feb.1998.

conventional military hardware, while the Soviet Union, and now Russia, supplied, and continue to supply, military equipment to India. However, in the case of China and the United States, there was something far more seriousr to their cooperation with Pakistan.

As will be discussed in the next two chapters, China provided extensive assistance to the Pakistani nuclear and missile programs. However, the United States was responisble, for not of providing material assistance, but of turning a 'blind eye' to the growing Pakistani nuclear program.

During the years of the Regan Administration, Pakistan was seen as a valuable and loyal ally in the fight against the Soviet occupation forces in Afghanistan. To this end, Pakistan received billions of dollars in American military and economic aid. It has been alleged that Pakistan used some of this money to make illegal purchases for its nuclear weapons program from suppliers in the United States, Germany and Switzerland.[78] Not only did the Regan Administration not do anything to stop this, successive Republican Administrations continued to certify Pakistan as being 'nuclear-free' in order to ensure a continuation in the flow of funds to Pakistan.[79] This amounted to bribing Pakistan for its continued assistance is supporting the war against Soviet forces in Afghanistan. What is even more surprising is that the Regan Administration's own intelligence analysts were warning about Pakistan's nuclear weapons program.

In 1990, the Bush Administration finally enforced American law and a total aid

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[78] Hersh, 'On the Nuclear Edge' p.57

[79] loc.cit
Under Ammendments brought in by Larry Pressler and Stephen Solarz, the United States government was supposed to cut-off all aid to Pakistan for illegally obtaining nuclear-related materials from the United States and for possessing nuclear weapons. The Administration was supposed to certify that Pakistan had no nuclear weapons to ensure the continuation of aid.

freeze was imposed on Pakistan.[80] This left Pakistan betrayed and embittered and less willing to accept American calls for restraint on its nuclear weapons program.[81] In India, however, the years of American indifference were seen as evidence of complicity and as such India has never believed United States Administration claims that Pakistan possessed no nuclear weapons.[82]

In India's case, while there is evidence, as will be seen in the next chapter, of heavy-water smuggling, there is no evidence that either the Soviet Union or Russia provided direct assistance to India's nuclear weapons program. However, the assistance provided by China, and the 'blind-eyes' turned by the United States to the Pakistani nuclear weapons program has ensured that India views the intentions of both these countries with suspicion.

Nuclear Prestige

It cannot be lost on either India or Pakistan that all five permanent members of the United Nations Security Council are nuclear powers. India, an aspiring power, sees nuclear weapons as the sole reason for the presence of the United Kingdom and France on the Security Council and feels particularly incensed that the possession of nuclear weapons by the five permanent members is legitimised, while India's right to such

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[80] These sanctions were then relaxed under the Brown Ammendment which was supported by the Clinton Administration. This was seen by some in India as continued American complicity in Pakistan's nuclear weapons program

[81] It must be said that it is unclear whether Pakistan *ever* heeded American calls for nuclear restraint.

[82] On March 18 1998, K.Subramanyam - one of India's leading 'hawks'- administered a stinging rebuke on Indian television to Professor Stephen Cohen for continuing to spout this line.

weapons is constantly questioned and doubted.[83]

For decades, successive Indian governments have made repeated calls for universal nuclear disarmament and have consistently refused to sign the Nuclear Non-Proliferation Treaty on the grounds that it legitimised nuclear weapons in the hands of a few nations while denying others that right.[84] However, India's and Pakistan's nuclear weapons and ballistic missile programs are as much about national pride and prestige as about security. Since the five 'legitimate' nuclear weapons states are given a great deal of influence over international security issues, India and Pakistan seek to translate their *de facto* nuclear status into greater international recognition. India, for example, wants a permanent berth on the United Nations Security Council.[85]

Pakistan is the only Muslim state in the world with a nuclear program sufficiently advanced to produce nuclear weapons without warning. India and Israel have expressed fears that Pakistan would assist countries like Saudi Arabia in arming their ballistic missiles with nuclear warheads.[86] Moreover, Pakistan apparently provided Iraq with significant assistance for Iraq's nuclear weapons program which, like

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[83] R.H.Munro, 'Superpower Rising',pp.17-18 in *Time International*: April 3 1989

[84] ibid p.16
In recent times, the late Indian Prime Minister Rajiv Gandhi put forward a comprehensive plan for disarmament. Like all other Indian disarmament initiatives, the plan was ignored by the five 'legitimate' nuclear powers. Rajiv Gandhi believed that India should be the prime mover towards a non-nuclear world.

[85] India is unlikely to ever get this wish. India, with its impeccable peacekeeping record and long democratic tradition is not supported by the United States or by the United Kingdom. Cynics might say that the United States is keen to fill the Security Council with cronies.

[86] L.Spector, Nuclear Ambitions ( Boulder, Colorado: Westview Press, 1990 ), p.110 This is nightmare scenario for Israel since Saudi Missiles can reach all Israel with impunity.

Pakistan's, was based on uranium-enrichment technology.[87] The ability of Pakistan to provide its assistance dramatically enhances its prestige in an increasingly anti-Western Islamic world.

The continued possession of nuclear weapons by the five recognized powers virtually ensures that moves to dissuade India and Pakistan from pursuing nuclear weapons are doomed to fail. Moreover, as has been shown earlier in this chapter, the United States, which is potentially the most influential power in the region, has lost a great deal of its credibility thanks to its somewhat inconsistent behaviour regarding Pakistan's nuclear program. China, on the other hand, is a decidedly partizan player, providing technical and material assistance to the Pakistani weapons programs.

Nuclear weapons are now a permanent feature of the India-Pakistan conflict. Both states see these weapons as guarantors of territorial integrity and as the ultimate deterrent against an adversary launching a war of dismemberment. Neither side will relinquish the nuclear option under any foreseeable circumstance. Moreover, the continuing high tension between the two countries means that a war, cannot be ruled out.

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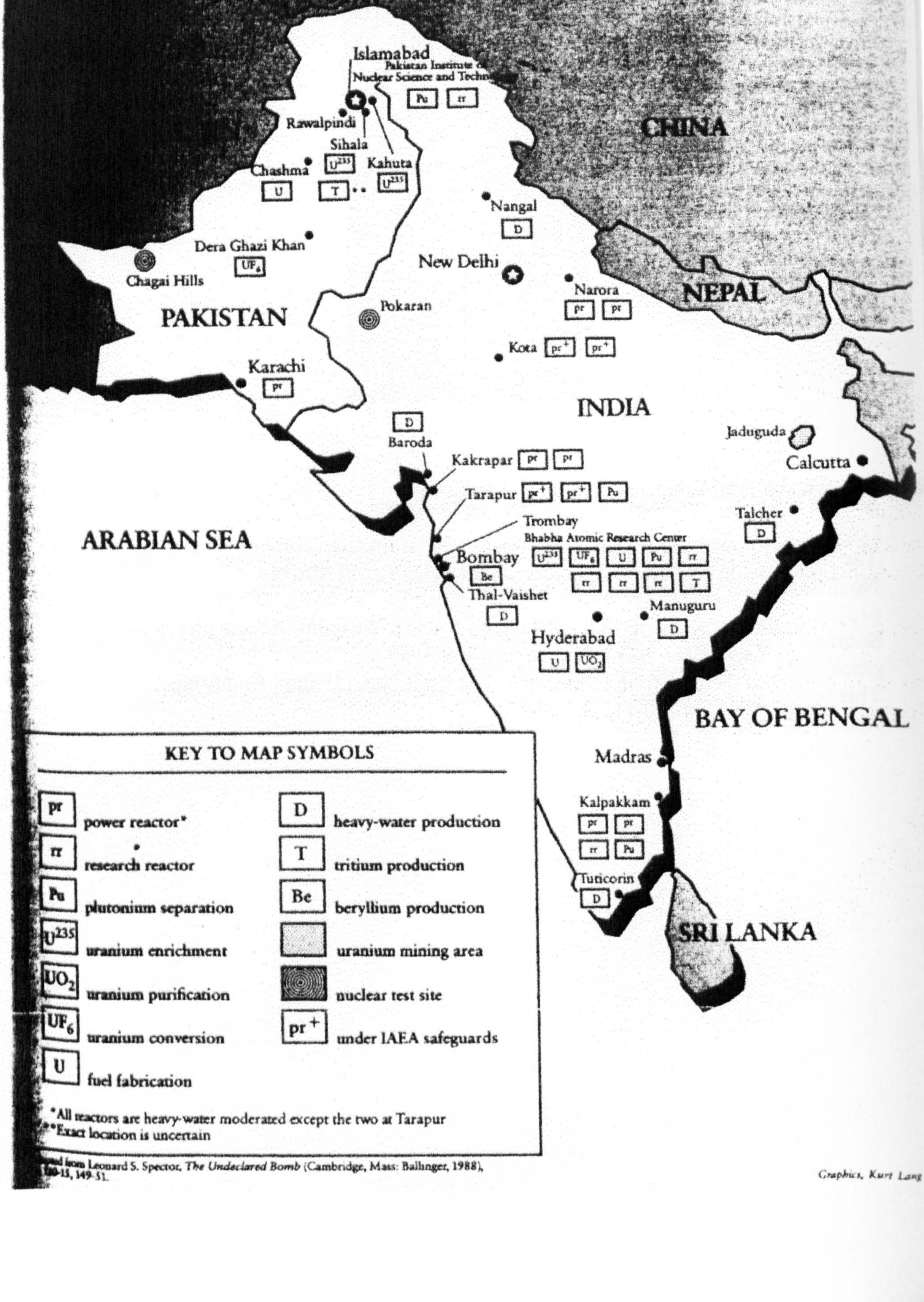
[87] 'Substance to Nuclear Allegations Against Iraq', p.13 in *MidEast Markets*: December 11 1989
With the demise of the Iraqi nuclear program following the 1991 war, it as yet somewhat unclear as to exactly where and how Pakistan provided assistance.

**MAP# 1:** Nuclear establishments in India and Pakistan.

The Map includes power and research reactors as well as uranium enrichment sites.
No distinction is made between safeguarded and unsafeguarded reactors.

Source: D.Albright & T.Zamora, 'India, Pakistan's Nuclear Weapons: All the pieces in place', p.23 in *Bulletin of the Atomic Scientists: June 1989*
This source adapted the map from L.Spector's, The Undeclared Bomb ( Cambridge, Mass: Ballinger 1988 ), pp.110-115 & 149-151.

# Nuclear forces on the subcontinent




...ed from Leonard S. Spector, *The Undeclared Bomb* (Cambridge, Mass: Ballinger, 1988), ...-15, 149-51.

*Graphics, Kurt Lang*

## *Chapter 2: Nuclear Capabilities*

### Indian Nuclear Capability - Development & Infrastructure:

India's nuclear program can trace its ancestry to the creation of the Institute for Fundamental Research (IFR) in 1945. Led by a brilliant and enthusiastic Cambridge educated physicist - Dr. Homi J. Bhabha - who was to have an enormous influence on nuclear research for both military and civilian purposes.[1]

The IFR's interest in nuclear energy found a receptive audience in Prime Minister Jawaharlal Nehru who saw nuclear energy as a source of power capable of fuelling India's economic development and industrial progress. The peaceful uses of nuclear energy was emphasised by both Nehru and Bhabha. Bhabha declared that:

> When nuclear energy has been successfully applied for power production in, say, a couple of decades from now, India will not have to look abroad for its experts, but will find them ready at home.[2]

Self-reliance was the cornerstone of India's nuclear program and Bhabha and his colleagues were tasked with developing a broad-based, predominantly self-reliant nuclear sector which would be the spearhead of technological development in other sectors of the Indian economy.[3] One year after independence the Indian Atomic Energy Commission (AEC) was set up with a mandate to develop a comprehensive nuclear program for civilian purposes.

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[1] W.E.Burrows & R.Windrem, Critical Mass: The Dangerous Race for Superweapons in a Fragmenting World ( New York: Simon & Schuster, 1994 ), p.354

[2] B.Chellaney, Nuclear Proliferation: The US-Indian Conflict ( New Delhi: Orient Longman Ltd., 1993 ),p.1 This statement outlines the goal that India has had with respect to nuclear power - complete self-reliance.

[3] ibid p.2

Headed by Homi J. Bhabha, the AEC, was to become the linchpin of the current Indian nuclear infrastructure. The Indian government gave the AEC clear guidelines that self-reliance was to be the ultimate objective:

> India should be able to produce all the basic materials required for the utilization of atomic energy ... The special requirements of atomic energy, the newness of the field, the strategic nature of its activities and its international and political significance have to be borne in mind ...[4]

By emphasising the peaceful aspects of the nuclear program, Indian scientists were able to learn a great deal from Western countries, especially Canada, France and the United States of America. In 1951, the French signed a nuclear cooperation agreement that provided for the training of Indian nuclear scientists in France. The Indian scientists were also instructed in the process of extracting plutonium from spent nuclear fuel - a process critical to the manufacture of atomic bombs with plutonium cores.[5]

The United States and Canada provided a great deal of training and equipment for Indian scientists, some of this assistance being provided under the 'Atoms for Peace' scheme of the Eisenhower administration.[6] The United States began cooperating with India for the construction of two nuclear power reactors at Tarapur while the Canadians were responsible for the supply of fuel to the CIRUS reactor which was built in India with extensive Canadian assistance.[7] These reactors were critical to the early stages of

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[4] Loc.cit. Quoted from the preamble to the Resolution of the Government of India creating the Atomic Energy Commission 1948

[5] Burrows & Windrem, Critical Mass, p.355

[6] Chellaney, Nuclear Proliferation,pp.1-8

[7] ibid pp.4-5

India's nuclear program.

India had the distinction of commissioning Asia's first nuclear reactor outside the then Soviet Union. The 'Apsara' research reactor was indigenously built in India and started operating in 1956.[8] Located at the Bhabha Atomic Research Centre, the reactor was a light-water/ medium-enriched uranium type which used uranium enriched to 20 - 50% as a fuel source.[9] As India lacked any sort of uranium enrichment facility at that time, the United Kingdom supplied the fuel under a 1955 contract.[10]

The 'Apsara' was followed by the 'CIRUS' 40MW research reactor which paved the way for nuclear cooperation with both the United States and Canada. This reactor was constructed with considerable assistance from Canada, although the major part of the technical effort involved in the construction of 'CIRUS' came from India.[11] As the reactor was a heavy-water/ natural uranium type, India initially needed external assistance for both the uranium fuel and the heavy-water coolant.[12]

Under a 1956 contract, Ottawa provided the initial requirement of fuel, but, since Canada had not yet fully developed its own heavy-water industry, the United States, under the auspices of President Eisenhower's 'Atoms for Peace' policy signed an agreement for the sale of 18.9 metric tonnes of heavy-water on March 16th. 1956.[13] In

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[8] ibid p.4

[9] L.S.Spector, Nuclear Ambitions: The Spread of Nuclear Weapons 1989-1990,(Boulder,Colorado:Westview Press, 1990 ),p.86

[10] Chellaney, Nuclear Proliferation, p.4 fn.10

[11] ibid p.5

[12] Spector, Nuclear Ambitions, p.87

[13] Chellaney, Nuclear Proliferation, pp.5-6

order to ensure that their assistance was not used for the development of nuclear weapons, both the United States and Canada obtained from India assurances that the heavy-water, the reactor, and the products obtained from it were to be used only for peaceful purposes.[14] There was, however, one very serious flaw - none of the agreements barred, either explicitly or implicitly, the use of the material in peaceful nuclear explosions (PNEs).[15] Dr. Bhabha consciously sought to avoid any agreements that would 'compromise, restrict or limit India's complete control over the reactor and its output.'[16]

These developments were undertaken in India with the aim of establishing a viable and self-reliant civilian nuclear industry. Prime Minister Nehru remained committed to the principle of a peaceful non-nuclear role throughout his tenure as India's leader. However, in the 1960s, his illusions were shattered by a Chinese invasion in 1962, and by China's detonation of a nuclear device in 1964.

The Chinese invasion of 1962 was sudden and totally unexpected by India's government. The Indian armed forces, suffering from years of neglect and from a fundamentally flawed forward deployment plan, was defeated in a series of bruising encounters in India's north-east and was under heavy pressure in the northernmost regions of the country. Nehru's government now began a major review of India's defence requirements. This marked the begining of India's quest for a nuclear weapons capability, though it would be more than a decade before India's first nuclear test..

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[14] Chellaney, Nuclear Proliferation, p.6

[15] Loc.cit.

[16] ibid p.7

Almost exactly two years later, on 16 October 1964, China tested a 20 kiloton atomic bomb.[17] This sent shockwaves through the Indian establishment and calls were made for the deployment of a nuclear arsenal. The panic generated forced Dr. Homi J. Bhabha to give public assurance that India could produce nuclear weapons within 18 months of getting political clearance.[18]

Nehru's successor, Lal Bahadur Shastri, came under increasing pressure from Bhabha and the rest of the nuclear establishment to carry out an underground test in January 1965. Shastri successfully resisted such pressure, but, shortly after the Chinese test in 1964, he is believed to have given the go-ahead for a project to reduce the lead time for the production of nuclear weapons from 18 months to just six.[19]

India's technical capacity had increased to a point where, by June 1965, enough plutonium for an atomic bomb would have been produced. Moreover, India was not neglecting the production of materials needed for thermonuclear weapons. By 1970, India would have the technical capacity to manufacture a bomb per week.[20] This increasing capability was largely due to the early assistance of Canada and the United States and the capabilities of the CIRUS reactor. Moreover, by 1966, India had acquired the ability to reprocess plutonium from the CIRUS reactor in the form of a plutonium reprocessing plant constructed with assistance from the United States and which was

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[17] SIPRI Yearbook 1974: Appendix 13G, p.507

[18] K.Subramanyam, India and the Nuclear Challenge ( New Delhi: Lancer International, 1986 ),p.222

[19] Spector, Nuclear Ambitions, p.64

[20] G.Mirchandani, India's Nuclear Dilemma ( New Delhi: Popular Book Services, 1968 ), p.176

then capable of reprocessing 30 metric tons of spent fuel per year.[21]

The Indian military was rather more cautious about nuclear weapons, being fully occupied with a massive expansion and modernization of conventional military forces. However, some middle-ranking officers made fairly strident calls for tactical nuclear weapons to be deployed to thwart any Chinese attack on India's north-eastern frontiers.

An extremely articulate and well-reasoned argument in favour of India developing nuclear weapons was made by Colonel R.D.Palsokar in 1966.[22] Assuming a Chinese attack on India's north-eastern regions, Palsokar creates a scenario where low-yield nuclear weapons are used by China to secure a tactical breakthrough. In this scenario, Palsokar argued that India would be unable to halt a Chinese advance and that huge tracts of territory would be lost.[23] To deal with this threat, he advocated the deployment of a limited number of nuclear weapons.

Palsokar, along with many other retired military officers argued that a small minimum deterrent would easily be within India's technical and economic reach. Quoting Major General D.Som Dutt, Palsokar argued that a deterrent force of 50 plutonium bombs, accrued at the rate of five per year and without an expensive missile-based delivery system would cost about $500 million over a ten year period.[24] Dr. Homi J. Bhabha argued that a stockpile of 50 two-megaton thermonuclear bombs would cost

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[21] Spector, Nuclear Ambitions, p.86

[22] Col.R.D.Palsokar, Minimum Deterrent: India's nuclear answer to China ( Bombay: Thacker & Co.Ltd., 1969 ), pp.57-58

[23] ibid p.59

[24] ibid p.140

Rs.150 million.[25] Dr. Sampooran Singh, director of the Terminal Ballistics Research Laboratory, went so far as to write:

> A nuclear bomb programme is technically feasible, politically highly desirable, strategically inescapable and economically, not only sustainable, but actually advantageous. The cost of a nuclear weapons programme would, instead of crushing the Indian economy, accelerate growth of industry and technology. This would provide 50,000 jobs for engineers, scientists and technicians.[26]

However, throughout the 1960s, no action was taken by the Indian government. The nuclear program suffered severe setbacks when Prime Minister Shastri died in late 1965, followed by Dr. Bhabha in an airline accident the following year. Shastri's successor, Indira Gandhi, was plagued with many internal and economic problems and so nuclear weapons had a low priority. Moreover, there was a decrease in tension between India and China and the initial panic had subsided. In addition, the military showed no major desire to possess nuclear weapons at that time. While there was no overt weaponization, the Indian government was extremely reluctant to relinquish its nuclear weapons option. The government of Indira Gandhi steadfastly refused to accede to the Treaty on the Non-Proliferation of Nuclear Weapons which came into being in 1970.

The Indian government, and many intellectuals and military officers, regarded the treaty as an attempt by the nuclear powers to separate themselves from the rest of the world by monopolising nuclear arms. In view of India's perceived threat from China, as well as the possible benefits of increased prestige from possessing nuclear weapons,

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[25] S.Singh, India and the Nuclear Bomb, ( New Delhi: S.Chand & Co. Ltd., 1971 ), p.135

[26] ibid pp.131-132

India refused to sign the N.P.T. India's prestige was further enhanced by inflicting a crushing military defeat on its arch-rival Pakistan during the 1971 war.

In the nuclear field, May 1972 saw the 'Purnima' research reactor become critical. This reactor provided the basic data regarding neutron multiplication factors, effectiveness of reflectors and critical mass assembly, all of which were essential to the development of a workable nuclear weapon. Key issues such as how to achieve the optimum explosive power and the dependence of this optimum explosive power on the first self-sustaining nuclear trigger were investigated through a series of simulations undertaken by BARC scientists.[27] The 'Purnima' facility used reprocessed plutonium from the 40MW 'Cirus' reactor and was of enormous help in the design and construction of India's first - and so far only - nuclear weapons test which took place on 18 May 1974 at the Pokharan test site.

The device tested at Pokharan had a yield of some 12 kilotons and used the implosion principle. It is not known exactly how much plutonium was used for the test, but, some informed Indian guesstimates indicated that it was about 10 kg - about one year's output from the 'Cirus' reactor.[28] This figure includes some plutonium lost during the machining of the core of the bomb. This leaves about 6-8 kg in the device itself.

The Pokharan device was exploded at a depth of 107 metres after being placed in an L-shaped hole.[29] It was long believed that the device tested was a 'crude' bomb.

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[27] P.R.Chari, Indo-Pak Nuclear Standoff: The Role of the United States, ( New Delhi: Manohar Publishers, 1995 ), p.48

[28] D.Albright & M.Hibbs, 'India's Silent Bomb', *Bulletin of the Atomic Scientists - September 1992*, p.29

[29] Chari, Indo-Pak Nuclear Standoff, p.49

However, in a 1994 magazine interview, the head of India's Atomic Energy Commission, Dr. Rajagopala Chidambaram, stated that India was confident of the design prior to the test and almost boasted about how 'good' the Indian 'bomb' was.[30]

It is interesting to note that Dr.Chidambaram, who was closely associated with designing the Pokharan device, used the word 'bomb' instead of the more widely used 'device'. Moreover, some observers point out that the 1974 device was small enough to fit down a metal pipe and hence would be small enough to fit into a bomb casing.[31] It may therefore be argued that the 1974 test was more of weapon tha a mere device.

The Indian civil nuclear program suffered from a series of sanctions and safeguards imposed after the 1974 test. India, having refused to sign the NPT and having no agreements with the United States or Canada barring the use of materials in Peaceful Nuclear Explosions , which is what the Pokharan test was called, did not violate any laws. It is a moot point about how 'Peaceful' a nuclear explosion could be, however, the United States did have a PNE program dating to the late 1950s under the name 'Ploughshare'. Nevertheless, the Indian test did violate the spirit, if not the letter, of the Indo-Canadian agreement.[32]

The impact on the Indian civil nuclear program was substantial and included the suspension, followed by the cancellation of Canadian assistance for the construction of

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[30] R.Chengappa, 'Nuclear Dilemma', *India Today: 30 April 1994*, p.50

[31] H.MacDonald, 'Destroyer of Worlds', *Far Eastern Economic Review: April 30 1992*, p.23

[32] Chellaney, Nuclear Proliferation, pp.5-6

two nuclear power plants in Rajasthan and the imposition of safeguards in 'perpetuity' and 'pursuit' clauses upon the Rajasthan reactors for the supply of heavy water from the USSR.[33]

Moreover, the United States and France dramatically reduced supplies of enriched uranium for the Tarapur reactors and an Experimental Fast Breeder Test reactor at Kalpakkam near Madras. The Nuclear Suppliers Group ( London Club ) was established in 1974 as a direct result of the Indian test as was the 1978 passage of the US Nuclear Non-Proliferation Act.[34] These measures are indicative of the alarm generated by India's nuclear test.

Between 1977 and 1980, the Janata coalition government held power in India. Little is known about the state of the nuclear weapons program during this time and some have argued that the nuclear weapons development program was allowed to stagnate. However, there is no clear evidence to suggest that this is the case, though it has been reported that the team that worked on the 1974 explosion was dispersed by the Janata government.[35]

On Mrs.Gandhi's return to power in 1980, it has been suggested that work on nuclear weapons was resumed. Evidence emerged that Pakistan had made rapid progress in the development of nuclear weapons in the mid-1980s and this must have accelerated India's nuclear weapons research.[36] Rumours also circulated that India was prepared to

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[33] Chari, Indo-Pak Nuclear Standoff, pp.50-51

[34] Loc.cit.

[35] 'Shadow of an Indian H-bomb', *Foreign Report Dec.13 1984*, p.1

[36] Loc.cit.

conduct another test in 1984, but, once again, no firm evidence has been published to indicate that this was true.[37]

Nonetheless, India's nuclear infrastructure underwent a dramatic expansion during the 1980s. Several new power reactors were commissioned and a new research reactor was commissioned at BARC. These, combined with existing plutonium reprocessing capabilities and the lack of international safeguards, substantially increased India's nuclear weapons design and production capabilities. India built up its potential weapons production capability from one per year in 1974 to a theoretical maximum of 40 per year in 1989-1990, though the actual production was probably much lower.

By 1990, four 235 MWe pressurized heavy-water reactors (PHWR) were commissioned - two each at Madras in South India and Narora in Uttar Pradesh.[38] In addition a 100 MW research reactor - 'Dhruva' - was commissioned in 1985 and, after numerous problems, reached full power by 1988.[39] The two Madras reactors were also plagued by operational problems that reduced their output by at least 50%.[40] However, it now appears that they currently operate at around 75% capacity.[41]

The Narora reactors seem to have performed somewhat better, perhaps owing to better design and maintenance. However, reactor Unit 1 of the Narora Atomic Power

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[37] Loc.cit.

[38] 'South Asia N-Weapon-Free Zone', p.454.E.2, in The Arms Control Reporter 1993 ( Cambridge MA: Institute of Defence and Disarmament Studies 1993 )

[39] Loc.cit.

[40] Spector, Nuclear Ambitions, p.72

[41] R.Chengappa'Ominous Incidents', *India Today: 30 June 1994*, p.57

Plant was severely damaged by a fire caused by cracks in turbine blades. This led to the phased shut-down of all nuclear power plants, one at a time, in India for safety checks by the Atomic Energy Regulatory Board.[42] The year 1995 showed a considerable improvement in the performance of India's power reactors. All seven power reactors performed consistently well in 1995. Four reactors achieved a 100% availability rate.[43] This was due to the efforts of the AERB and indicates that many problems have been overcome.

In addition, there is considerable evidence to indicate that India indulged in large-scale heavy-water smuggling to start these reactors. While the reports have been strenuously denied by the Indian authorities, others have also admitted that there was a significant shortfall in domestic heavy water production in the early 1980s - the period during which the 'Dhruva' research reactor and the two Madras power reactors were initially commissioned.[44] It is widely assumed that this smuggling was done to avoid international safeguards on the plutonium produced from these reactors. It should be noted that India has apparently overcome its heavy-water production shortages and has managed to obtain a sizeable surplus.[45] In 1994, India obtained a contract to export 100 tonnes of heavy water to South Korea.[46]

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[42] 'South Asia N-Weapon-Free Zone', pp.454.B.182-183 in The Arms Control Reporter 1993

[43] 'Record Generation by Nuclear Power Stations', *The Hindu-International Edition: Sat. September 2 1995*, p.10

[44] Spector, Nuclear Ambitions, pp.72-73

[45] 'South Asia N-Weapon-Free Zone',p.454.B.185, in The Arms Control Reporter 1993

[46] 'South Asia Nuclear-Weapon-Free Zone', p.454.B.198 in The Arms Control Reporter 1994

At present, India's nuclear infrastructure consists of six unsafeguarded PHW reactors in the 235 MWe class and four safeguarded plants, two in Rajasthan and two at Tarapur. In addition, there are two major research reactors, 'Cirus' and 'Dhruva', and two plutonium reprocessing sites at Tarapur. Another major reprocessing site at Madras is undergoing final safety checks and should soon commence operations.[47]

There are also a number of small research reactors and a Fast-Breeder Test Reactor (FBTR), as well as two uranium enrichment facilities, one at BARC and another larger unit at Mysore, which began producing enriched uranium in mid-1990 at the earliest.[48] India is also involved in constructing several other PHWRs at various locations to be completed in the late 1990s.

These facilities provide India with a very substantial nuclear weapons production base. However, it is very difficult to estimate the exact plutonium production stockpile since the reprocessing plants rarely function at their design capacity and the unsafeguarded power reactors have had their share of problems which have significantly reduced their output.

Nonetheless, some broad estimates can be made. When judging the output from the power reactors, some basic calculations have to be made. For the purposes of this study, Leonard Spector's assessment that a 235 MWe reactor can produce 60kg of plutonium per year in its spent fuel is being used. This is in theory enough for 12 basic

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[47] 'South Asia N-Weapon-Free Zone',p.454.E.2, in The Arms Control Reporter 1993

[48] Albright & Hibbs, 'India's Silent Bomb', p.29

20kt atomic devices - using 5kg of plutonium per device.[49] The output from the power reactors cannot be ignored as the reactors are continuously fuelled.

Normally, refuelling of a power reactor only occurs when the uranium fuel has been exhausted. This is known as 'high burn-up' spent fuel. The plutonium produced from this fuel is usable in nuclear weapons, but contains more of the plutonium-240 isotope than is desirable - this can lead to uncertainty in the yield of nuclear weapons. In contrast, continuously fuelled reactors are refuelled at a faster pace. These reactors, such as the six unsafeguarded Indian units, produce 'low burn-up' spent fuel in which the plutonium is ideal for nuclear weapons.[50] Moreover, the design of the CANDU type reactors permits for the refuelling of the reactors without actually having to shut down the reactors, nor is there any signature visible outside the reactor that indicates that the fuel rods are being changed.[51]

In addition to the power reactors, the 'Cirus' and 'Dhruva' reactors are capable of producing substantial quantities of plutonium per year. 'Cirus' can produce about 9-10 kg of plutonium annually, while the 'Dhruva' can produce 25 kg.[52] This combined total is sufficient for between five and seven nuclear weapons. When combined with the output from the power reactors, India's weapons production capacity can be summarized as follows:

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[49] Spector, Nuclear Ambitions, p.71

[50] ibid, pp.325-326 Note 58. Spector gives an excellent account on the difference between the two reactor types and the suitability of their plutonium for nuclear weapons.

[51] http://www.fas.org/spp/starwars/advocate/ifpa/report696_ch4_ind.htm

[52] Albright & Hibbs, 'India's Silent Bomb', p.28

| Reactor | Capacity | Plutonium Output | Weapons Potential |
|---|---|---|---|
| Cirus | 40 MW | 9-10 kg/year | 1-2/yr |
| Dhruva | 100 MW | 20-25 kg/yr | 4-5/yr |
| MAPP - Madras | 2 *x* 235 MWe | 2 *x* 60 kg/yr | 2 *x* 12 = 24/yr |
| NAPP - Narora | 2 *x* 235 MWe | 2 *x* 60 kg/yr | 2 *x* 12 = 24/yr |
| KAPP- Kakrapar | 2 *x* 235 MWe | 2 *x* 60 kg/yr | 2 *x* 12 = 24/yr |
| **Total** | | 389-395 kg/yr | 77-79/yr |

Sources:[53] Spector, Nuclear Ambitions, p.51; Albright & Hibbs, 'India's Silent Bomb', p.28 & Arms Control Reporter 1993, p.B176

It must be stressed that this represents the total possible plutonium production per year. It is highly improbable that this is the actual figure achieved. It has been mentioned before that the Madras reactors, in particular, were initially plagued with operating problems. These sorts of technical problems will affect the output of the reactors. The fire at Unit 1 of the Narora Atomic Power Plant, however, has led to a serious review of the operating record of the Indian nuclear industry.

Estimating India's existing plutonium stockpile is rather more difficult. David Albright, Frans Berkhout and William Walker, in a 1993 SIPRI publication, estimated that by 1995, India would have about 425kg of weapons grade plutonium - enough for 85 nuclear weapons - by the end of 1995.[54] The breakdown is as follows:

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[53] These tables were complied by the author from the three sources listed.

[54] S.Gordon, India's Rise to Power in the Twentieth Century and Beyond ( London: Macmillan Press Ltd., 1995 ), p.93

| Production in kgs<br><br>**Source** | Stockpile at end of 1991 in<br><br>kgs | Stockpile at end of 1995 in<br><br>kgs |
|---|---|---|
| Cirus reactor | 245 | 280 |
| Dhruva reactor | 100 | 190 |
| CANDU (First Discharges) | 15 | 30 |
| Total Production | 360 | 500. |

| Consumption in kgs | 1991 in kgs | 1995 in kgs |
|---|---|---|
| 1974 test | 10 | 10 |
| Processing losses (3%) | 10 | 15 |
| Fast reactor | 50 | 50 |
| Total consumption | 70 | 75 |
| **TOTAL Stockpile** | 290 | 425 |

Source: 'South Asian Nuclear-Weapon-Free Zone' in The Arms Control Reporter 1993, p.454.B.176

This estimate is the most widely quoted, but largely excludes the output from the Madras, Narora and Kakrapar power reactors. It was assumed by the authors of the SIPRI report that the plutonium obtained from these reactors was to be used as the core of an Indian Fast-Breeder reactor program.[55] However, it appears that the Indian Fast Breeder program is progressing extremely slowly and is plagued by financial problems.[56] It is therefore unlikely that any of the plutonium from the power reactors will be needed in the near future.

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[55] Loc.cit.

[56] V.Menon, 'Moving at a Snail's Pace', *India Today:November 30 1994*, pp.66-67

It is estimated that India's power reactors have discharged spent fuel containing a staggering 4500 kgs of plutonium.[57] It is assumed that much of this fuel has not been reprocessed because of the enormous distances from many of the reactors and the Power Reactor Fuel Reprocessing Plant ( PREFRE ) at Tarapur.[58] However, it is known that fuel from the MAPP 1 reactor located in Madras has been reprocessed at Tarapur.[59] There is no reason why India cannot reprocess more of this spent fuel.

It can perhaps be argued that the key point about India's unsafeguarded nuclear program is not so much how much plutonium has already been reprocessed, but the capacity of the Indian program to rapidly increase the amount of plutonium reprocessed throughout the 1990s.

It is estimated that PREFRE alone could separate between 500 and 1500 kg of reactor grade plutonium in the remainder of the 1990s.[60] A new plant at Kalpakkam, which should be commissioned in 1996-97 would be capable of reprocessing 150 tonnes of spent fuel per year, to give about 525kg of plutonium per year or 2625kg by the end of the century.

The combined output from Kalpakkam and PREFRE would give a total of at least 3000kg of plutonium by the end of the century, possibly as high as 4000kg.[61] This

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[57] A.Haniffa, 'Effect on India of Fissile Cutoff Treaty', *India Abroad: February 23 1996*, p.26

[58] Loc.cit.

[59] Spector, Nuclear Ambitions, p.67

[60] Gordon, India's Rise to Power, p.94. It should be pointed out that 7kg of reactor grade plutonium is needed for a 20kt atomic device - as against 5kg of weapons grade plutonium. See A.Haniffa, 'Effect on India of Fissile Cutoff Treaty',p.26.

[61] Loc.cit.

is potentially sufficient for several hundred 20kt yield atomic weapons. By the mid 1990s, India could have the production and reprocessing capacity to manufacture 100 atomic weapons per year.[62] The continuous fuelling design of the Indian power reactors further enhances this significant capability. This does not mean that India will choose to manufacture such a large number of nuclear weapons. What it does mean is that India can field a very substantial nuclear arsenal should it choose to do so or if circumstances force the Indian government into a nuclear arms race.

The estimates for India's existing stockpile of atomic weapons, if any, depends very much on its plutonium stockpile. This stockpile, in turn, depends on how much spent fuel from the power reactors has actually been reprocessed. India, therefore, has a potential arsenal, of at least 85 weapons and possibly many more.

In addition to the standard plutonium and enriched uranium routes, India has a third nuclear weapons manufacturing option. India could theoretically make use of U-233 for any nuclear weapons. U-233 is a fissile isotope of uranium and is potentially excellent for use in nuclear weapons, requiring as much material per bomb as plutonium - about 5 kg.[63] However, U-233 has not yet been used in nuclear weapons.

India has the largest reserves of non-fissile thorium in the world. U-233 is produced by irradiating thorium in a reactor. India has already managed to obtain kilogram quantities of U-233 by irradiating thorium in the 'Cirus', 'Dhruva' & MAPP reactors.[64] India hopes to use U-233 as a fuel in power reactors in the future and attaches

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[62] A.Haniffa,'Effect on India of Fissile Cutoff Treaty',p.26

[63] Albright & Hibbs, 'India's Silent Bomb', p.29

[64] Loc.cit.

very high priority to this objective.

On October 29 1996, a 30 KW research reactor called 'Kamini' attained criticality. This reactor is unique in that it uses U-233, obtained from thorium as a fuel.[65] This indicates that India intends to continue with its U-233 program and will certainly produce more U-233 in the future. This will be used primarily for fuel in the power sector, but could no doubt be used for military purposes should India desire to do so.

While India's production capability is not in doubt, what types of nuclear weapons India might be able to construct is much less well known. It has always been assumed that any Indian nuclear arsenal would be limited to first generation fission bombs in the 20 kiloton yield. India, because of political considerations and international pressure is unlikely to be able to conduct another nuclear test. Any developments must, therefore, be made under this constraint.[66]

India is believed to have programs for both enhanced-fission and fusion weapons. However, a full-fledged thermonuclear arsenal would probably need at least one more nuclear test. Thermonuclear weapons differ substantially from either fission or enhanced fission weapons and as such are more difficult for India to simulate. Evidence for an Indian fusion weapon program is somewhat circumstantial, but is nonetheless substantial.

According to some sources, India probably has all the basic scientific and technical expertise to build thermonuclear weapons and that should Pakistan conduct a

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[65] 'Kamini Reactor attains Critiçality', *The Hindu - International Edition: Saturday 9 November 1996*, p.12

[66] This is dealt with in more detail in Chapter 6

nuclear test, India would conduct a thermonuclear test within two months.[67] In addition, BARC engages in lithium 6 purification and production and has an extensive inertial confinement fusion ( ICF ) program. This facility would be useful in the study of high density physics associated with thermonuclear explosions, the improvement of elaborate computer codes and the development of sophisticated diagnostic techniques and instrumentation.[68] According to a recent article in the *International Defence Review*, these inertial confinement fusion devices are critical to the development of the next generation of nuclear and thermonuclear weapons.[69] This means that India's investment in ICF facilities should be seen as highly significant.

In fact, one journalist, W.P.S.Sidhu, made the claim that all the theoretical work on both fusion and enhanced fission weapons was completed by the middle of the 1980s.[70] However, India would be unlikely to initiate the construction of thermonuclear weapons, which would be a very expensive undertaking, without ensuring the complete soundness of the design. This would be difficult, if not impossible, without at least one more nuclear test.

While thermonuclear weapons may not appear in any possible Indian arsenal for some time, boosted or enhanced fission weapons are another story. These weapons use

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[67] D.Albright & T.Zamora, 'India, Pakistan's Nuclear Weapons: All the Pieces in Place', *The Bulletin of the Atomic Scientists: June 1989*, p.25

[68] Albright & Hibbs, 'India's Silent Bomb', p.30

[69] F.Barnaby,'Civil Science could drive tomorrows nukes',*International Defence Review: 1/1997*,p.62

[70] W.P.S.Sidhu,'India's Nuclear Tests - Technical & Military Imperatives', in *Jane's Intelligence Review: April 1996*, p.172

either lithium deuteride or tritium to enhance the yield of fission weapons, enabling major savings in weight. India manufactures tritium and its lithium-6 purification and production facilities enable it to produce the raw materials required for these weapons.

Moreover, India's production of beryllium metal enables the production of smaller, lighter and more advanced nuclear weapons. The production of beryllium metal began in the late 1980s after substantial quantities were imported.[71] There have been some reports of problems with the beryllium manufacturing plant, however, there is no doubt that the basic capabilities are present.

Since a few grams of tritium mixed with roughly equal amounts of deuterium inside a warhead can boost the yield of a fission explosion by between five and ten times, India's weapons potential is significantly enhanced by this technology. General K.Sundarji, one of India's most influential Chiefs of Army Staff, speculated that India's future arsenal should be composed of weapons in the 20-150 kiloton range.[72] So-called 'super-boosted' fission weapons would possess yields as high as 150 kt.[73] These weapons, if combined with a reasonably accurate missile delivery system, eliminate the need for the development of extremely expensive thermonuclear weapons for use against either counterforce or countervalue targets. In India's context, fusion weapons

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[71] Albright & Hibbs, 'India's Silent Bomb',p.30

[72] General K.Sundarji, Blind Men of Hindoostan: Indo-Pak Nuclear War(New Delhi:UBS Publishers' Distributors Ltd, 1993),p.79

[73] It is technically possible to build fission and 'boosted' fission weapons with yields of up to 500kT. The United States tested a 500kT fission bomb in 1952 as part of Operation Ivy. See the Federation of American Website -http://www.fas.org

are virtually unnecessary.[74]

The question remains, however, as to whether India can manufacture these enhanced fission weapons without conducting a nuclear test. It has long been assumed that Israel is capable of manufacturing these weapons and has already deployed them.[75] India's nuclear infrastructure and scientific base is probably at least as well developed as Israel's, if not considerably more advanced, and is far more extensive. If Israel can develop these weapons, there is no reason why India cannot. India probably has the most advanced nuclear research and development program of any of the threshold nuclear states. The development of ICF devices indicates that Indian technology is reasonably advanced in the nuclear weapons field. Moreover, it must be remembered that India has been in the nuclear weapons business for close to thirty years. Much progress has been made during this time.

The Indian government has also invested heavily in the field of parallel supercomputing and its related software. The Centre for Development of Advanced Computing (CDAC),in close association of the super-secret Advanced Numerical Research and Analysis Group (ANURAG) of the Defence Research and Development Organization (DRDO), has succeeded in developing a wide range of supercomputers, including, the 'Param' family with speeds of billions of floating operations per second has been the most successful.[76] India is also known to have programs for the

[74] India's tritium production capacity is discussed in P.Hoodbhoy & M.Kalinowski, 'The Tritium Solution' in *The Bulletin of the Atomic Scientists - July August 1996.*
The fact that India is stockpiling tritium -possibly for use in nuclear weapons was disclosed in T.S.Gopi Rethinaraj, 'Tritium breakthrough brings India closer to an H-bomb arsenal' *Jane's Intelligence Review:Jan 1998*

[75] Spector, Nuclear Ambitions, p.162

development of parallel super-computers with speeds of teraflops, that is, trillions of floating operations per second.[77] Combined with the other super-computers and India's software skills, India possesses the basic requirements for the simulated testing of many types of nuclear weapons. Moreover, since the systems are indigenously produced, India has effectively managed to overcome the technology restrictions imposed on it by the United States.

Since BARC has been closely linked to these organization, it is probable that BARC has obtained the best products of CDAC and ANURAG. India's skill in software design, combined with these supercomputers and parallel computers, should enable it to 'cold test' any nuclear device.[78] India has managed to achieve a relatively high degree of competence in both these fields. That India could avoid an overt nuclear test by resorting to computer simulation was virtually confirmed by a United News of India story in early April 1998.[79]

That India could manufacture enhanced-fission weapons without another nuclear test was confirmed by a high ranking BARC scientist to an Indian defence journalist - Pravin Sawhney. He was initially convinced that India needed to conduct another nuclear test until he was told by the scientist that India could readily manufacture either

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[76] Gordon, India's Rise to Power, p.37 PARAM 9000, for example, has a speed of 2.5 billion flops. PARAM 10000 has a speed of 100 billion flops

[77] Loc.cit.

[78] ibid p.95

[79] 'Param 10000: India's Answer to nuclear ban' - UNI story in *The Asian Age : 6 April 1998*

fission or enhanced fission weapons without needing to conduct another test.[80] Another source also hinted that India could rapidly deploy a fairly sizeable number of enhanced fission weapons in the 50 to 100 kiloton range.[81]

With India's very large plutonium stockpile, its manufacture of beryllium, tritium and lithium 6, India's nuclear capability cannot be seen simply in terms of its ability to manufacture a number of low-yield first-generation fission devices. An Indian nuclear arsenal will, in all probability, include a sizeable number of enhanced fission weapons in the 100-150 kiloton yield as well as a larger number of smaller fission weapons in the 20 kiloton yield. This arsenal can probably be constructed without further testing and deployed in a fairly short period of time. It is also likely that India has taken steps to design very large enhanced-fission weapons in the 500 kiloton range.

Whether or not India has deployed such an arsenal or whether it will do so in the future cannot be clearly answered at present. Much will depend on India's security perceptions in the future and on domestic Indian politics. The other thing that must be remembered is that India has not admitted to possessing nuclear weapons. It is not, therefore, beyond the realms of possibility that India might develop and deploy a small nuclear deterrent without making it public. The Indian military's mania for security makes it difficult to predict exactly what will happen in the future.

However, the capabilities that exist are very substantial indeed and give any Indian government a wide variety of options that may well be exercised in the years to

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[80] P.Sawhney, 'The not-so-bright stars of the Republic Day', *The Asian Age: 1 February 1996*, p.15

[81] S.P.Baranwal, Military Yearbook 1990-1991 ( New Delhi: Guide Publications, 1991 ), p.157

come. The cryptic responses of Indian nuclear scientists might well become clearer. In the meantime,analysts, both Indian and Western, have to continue to make assumptions on the basis of statements that could be interpreted to mean almost anything. When asked whether or not India was still making bombs Dr. Rajagopala Chidambaram made the following statement :

> Let me just say that we have built up an extraordinary range of knowhow and expertise on all aspects of nuclear technology ... There is now nothing India cannot do.[82]

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[82] Chengappa, 'Nuclear Dilemma', p.50

## Pakistan's Nuclear Capability: - Development & Infrastructure

One of the interesting contrasts between the Indian and Pakistani nuclear programs is the fact that the Pakistani program, while much smaller and less sophisticated than India's mammoth effort, has, from the very outset, been almost totally military orientated. The program was initiated after Pakistan's most comprehensive military defeat and, to a great extent, has come to symbolize Pakistan's ability to prevent another military catastrophe.

The Pakistani nuclear program was initiated after the country's crushing defeat in the 1971 Indo-Pakistani War.[83] In 1972, Pakistan's Prime Minister, Zulfikar Ali Bhutto, apparently announced his plan to develop nuclear arms at a top secret meeting of Pakistan's top nuclear scientists in Multan.[84] Pakistan, at the time, faced Indian conventional military superiority as well as a significant, but then as yet undemonstrated, Indian nuclear capability. There is little doubt that India's 1974 Pokharan test gave a sense of urgency to the Pakistani program.

From the early to mid-1970s, it seems that Pakistan intended to follow India's example and develop a nuclear weapons program based on the plutonium extraction route. To this end, Pakistan attempted to acquire a large plutonium reprocessing plant from France. Despite French insistence that the plant be placed under IAEA safeguards, suspicions were raised as Pakistan then had, as she still has, only one small natural

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[83] Spector, Nuclear Ambitions, p.90

[84] Weissman,S., & Krosney,H. The Islamic Bomb ( New York: Times Books, 1981 ), pp.43-46

uranium fuelled power reactor.[85] Washington was so concerned about the possibility of the diversion of the plant to military purposes that the Ford and Carter Administrations offered Pakistan 110 A-7 Corsair II attack aircraft if the deal was cancelled[86] In 1977, however, France reversed its earlier position and suspended deliveries to the plant, apparently after the United States shared intelligence reports revealing Pakistani intentions.[87]

A major shift then occurred in Pakistani nuclear development. At the urging of Dr. Abdul Qadeer Khan, a German trained metallurgist, Pakistan shifted its effort from plutonium reprocessing to uranium enrichment. This remains the major thrust of Pakistan's nuclear effort to this day, despite periodic attempts to revive the plutonium route.

The uranium enrichment project was made autonomous from the Pakistani Atomic Energy Commission in 1976. This was probably to enhance security. The urgency attached to the project was evident from the fact that elements of the program were undertaken simultaneously.[88] The cornerstone of Pakistan's uranium enrichment program is the massive ultracentrifuge plant at Kahuta. This plant, capable of producing between 25-75 kilograms of weapons grade uranium per year, is virtually the sole basis

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[85] Spector, Nuclear Ambitions, p.90 & p.114

[86] Gunston,B.,Modern Military Aircraft (London: Salamander Books, 1977) p.106

[87] Spector, Nuclear Ambitions, p.90 The plant, located at Chasma, still has not been fully completed. The proposed A-7 sale also failed to materialise.

[88] ibid p.91

for Pakistan's current nuclear capability.[89] A smaller, probably experimental plant was constructed at Sihala. Construction of the Sihala plant started in 1978 and it was placed in operation the following year. Construction of the Kahuta plant proceeded in parallel with the Sihala project.[90]

As in the case of India, Pakistan indulged in large scale smuggling activities in order to accelerate the construction of the Kahuta plant. The Pakistani government employed a strategy whereby equipment and related items were obtained from Western countries, often in clear violation of export control laws.[91] The items and equipment obtained included design technology for gas centrifuges and vacuum pumps and other equipment for handling uranium hexafluoride gas. Some of the equipment was specifically designed to handle weapons grade material.[92] In addition, Pakistan was able, with the help of a West German businessman, to procure an entire installation for converting natural uranium into uranium hexafluoride, the substance processed in enrichment plants.[93] There is no doubt that this smuggling activity enabled the Pakistanis to substantially accelerate the completion of the Kahuta plant.

Uranium enrichment is not the easiest method of obtaining weapons grade material. However, it was the only option left open to Pakistan. Pakistan has only a single pressurized heavy water power reactor located at Karachi ( KANUPP ). This

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[89] Albright & Zamora, 'India, Pakistan's Nuclear Weapons: All the Pieces in Place', p.20

[90] Spector, Nuclear Ambitions, p.91

[91] Loc.cit.

[92] ibid p.34

[93] Loc.cit.

facility is currently operating under IAEA safeguards.[94]

As discussed earlier, Pakistan's attempts to obtain a large plutonium reprocessing plant from France failed to materialize. However, a small plant called 'New Labs' at Rawalpindi is in existence. This plant is currently not actually under IAEA safeguards. The 'New Labs' plant can, in theory, separate 10-20kg of plutonium per year. It is not known, however, if the plant is operational or whether the theoretical capacity can be reached.[95] This is due to the fact that reprocessing plants seldom operate at their design potential. It is alleged that the West German firm NTG Nukleartechnik GmbH supplied Pakistan with the ability to design and construct a small pool-type nuclear reactor. This would give Pakistan the ability to construct a small reactor with an output of 50MW which would produce enough plutonium for two nuclear weapons a year.[96] These developments, while significant, clearly demonstrate that Pakistan has largely been prevented from following the plutonium route for nuclear weapons. With foreign assistance, however, Pakistan has managed to develop a very substantial uranium enrichment program.

The Kahuta enrichment plant is, as was mentioned before, the cornerstone of Pakistan's nuclear weapons capability. The plant is designed to enrich natural uranium, which is composed of 99.3% U-238 and almost 0.7% U-235, until it is 93% U-235.[97]

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[94] ibid p.114

[95] Albright & Zamora, 'India, Pakistan's Nuclear Weapons:All the Pieces in Place' p.21

[96] Loc.cit.

[97] Spector, Nuclear Ambitions, pp.439-441

This highly enriched uranium can be used for nuclear weapons.[98]

More enriched uranium is required to produce a 20kt nuclear weapon than plutonium. Between 15 to 25 kg of U-235 are needed for a fission device in the 15-20kt yield, compared to 4-8kg of Pu-239.[99] The IAEA, for its purposes, estimates that 25kg of highly-enriched uranium are needed. However, if Pakistan employed certain well-known design features, the figure of 15kg is possible. It is reported that Pakistan obtained a complete working design of a nuclear weapon derived from China's fourth atmospheric nuclear test which used U-235 as the fissile material.[100] If this is true, then Pakistan would be in possession of a fairly advanced design, requiring less fissile material.

The capacity of the Kahuta enrichment plant is somewhat uncertain. Senator Alan Cranston, in a presentation to the United States Senate in 1984, stated that the Kahuta plant had the capacity to produce 45kg of highly enriched uranium and was being expanded to an annual capacity of between 90-120kgs. This would theoretically give Pakistan the capacity to produce 5-6 Hiroshima sized nuclear weapons per year.[101] However, Leonard Spector, writing in 1990, estimated the capacity of the Kahuta plant at about 50kg of highly enriched uranium annually.[102] Spector based his calculations on

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[98] Low enriched uranium, which contains less than 20% U-235,is used as a nuclear fuel. Medium enriched uranium - 20- 50% U-235 - can be used for nuclear weapons, but very large quantities are needed.

[99] Chari, Indo-Pak Nuclear Standoff, p.46

[100] P.Sawhney, 'To Test or Not to Test: The Challenge to India's Nuclear Credibility', *RUSI Journal: June 1996*, p.32

[101] ibid pp.45-46

[102] Spector, Nuclear Ambitions, p.114

the fact that a report, quoting U.S. officials, indicated that Pakistan, by the end of 1987, had acquired 100kg of highly-enriched uranium. Though the Kahuta plant started small-scale operations in 1984, it was not until early 1986 that weapons grade material was first produced.[103] This would give an annual production capacity of 50 kg of highly enriched uranium per year, which is sufficient for about three fission weapons.

Pakistan has been attempting to expand its nuclear enrichment facilities and is thought to be trying to expand the Kahuta plant and to construct another facility at Golra. The status of these programs is not known. It is likely that some expansion of the Kahuta plant has taken place, but, the completion of the Golra plant has been substantially delayed. Pakistan can no longer rely on smuggling to obtain equipment. Pakistan has also indulged in smuggling to obtain other elements needed for the manufacture of nuclear weapons. In 1984, Canadian authorities intercepted fifty nuclear triggers - called krytrons - intended for Pakistan.[104] In 1988, the West German company Nuchem was caught shipping tritium and uranium hexafluoride to Pakistan.[105]

In fact the Pakistani nuclear program was heavily dependent on German assistance for most of its elements and many of its future plans. Six ongoing projects depended heavily on equipment and designs from the advanced nuclear states. These included the original Kahuta enrichment plant, the Dera Ghazi Khan uranium hexafluoride plant, a major expansion in enrichment capability, the designs of a reactor

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[103] ibid p.114 & p.338 note 68

[104] ibid p.92

[105] S. Gupta, 'Nawaz Sharif's Bombshell', *India Today: September 15 1994*, p.28

that could be used for the production of tritium and a tritium purification plant.[106] Pakistan also made several attempts to obtain beryllium from West Germany and the United States. In some cases, Pakistan has succeeded.[107]

China has, in recent times, become Pakistan's major nuclear supplier. China has assisted Pakistan in the construction of a 30KW enriched uranium fuelled reactor and is planning the construction of a 300 MW power reactor at Chasma.[108] China, however, claims that any nuclear cooperation with Pakistan is being conducted under the auspices of IAEA safeguards.[109] Whether the plant is safeguarded or not, it will be several years before its plutonium can be reprocessed for use in nuclear weapons. It takes up to two years for the radioactivity level of the plutonium produced to fall sufficiently to permit safe reprocessing.[110]

Perhaps more significantly, Pakistan admitted to the existence of a small research reactor in the 50MW class which was built with Chinese assistance at Kushab in Punjab.[111] The design of this reactor is probably based on that obtained from the West German firm NTG Nukleartechnik GmbH mentioned earlier. It is conceivable that plutonium from this reactor could be diverted to the nuclear weapons program, however,

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[106] Spector Nuclear Ambitions, p.35

[107] Albright & Zamora, 'India, Pakistan's nuclear weapons:all the pieces in place', p.22

[108] T.S.Subramaniam, 'A guessing game', *Frontline: January 26 1996*, p.16

[109] 'China tells India no nuclear arms sold to Pak.'in *The Asian Age: Saturday-Sunday 30 November-1 December 1996*, p.4

[110] Haniffa,'Effect on India of fissile cut-off treaty',p.26

[111] P.Sawhney, 'Standing Alone: India's Nuclear Imperative', *International Defence Review: November 1996*,p.27

it is uncertain whether this reactor is actually in service or not as construction only started in the mid- to late-1980s. It should also be pointed out that Pakistan has not developed an indigenous nuclear power industrial base. Pakistan is not capable of designing its own power reactors and has needed considerable outside assistance for its research reactors.

Pakistan is also reported to have sought China's help in obtaining ring magnets for its centrifuges, though this was strenuously denied. In 1996, it was reported that China supplied some 5,000 ring magnets to the Abdul Qadeer Khan Research Laboratory at Kahuta - the site of Pakistan's main enrichment plant.[112] It is not clear what these ring magnets are going to be used for. They could either be used to expand the production of enriched uranium or may simply be used as spares since the enrichment process creates a great deal of stress in all components of the plant. Pakistan's relatively small nuclear infrastructure would probably be hard pressed to sustain the theoretical capacity of the Kahuta plant. If Pakistan began to produce weapons grade plutonium, it would be difficult to sustain as neither reactors nor reprocessing plants ever operate to their design capacity. Moreover, any plutonium produced would have to be left for up to two years to permit radioactivity to die down before reprocessing could start.[113] Pakistan's existing nuclear infrastructure can be summarized in the following table:

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[112] A.Haniffa, 'U.S.in a bind over A-technology transfer to Pakistan', *India Abroad: February 16 1996*, p.20

[113] A.Haniffa, 'Effect on India of Fissile Cutoff Treaty',p.26

| Type | Location | Capacity | Comments |
|---|---|---|---|
| Ultracentrifuge - uranium enrichment plant | Kahuta | 50 kg or weapons grade uranium per year | Second plant reported under construction |
| Plutonium Reprocessing plant | Chasma | 100-200 kg of plutonium per year | Not finished. Work continuing - Chinese help |
| Power Reactor | Karachi | 125 MWe | Safeguarded |
| Research Reactor | Kushab | 50 MWe | Chinese assistance - start up date unknown but recent |
| Power Reactor | Chasma | 300 MWe | Proposed |

Source: Spector, Nuclear Ambitions, pp.114-117
T. Subramaniam, 'A guessing game' Frontline: 26 January 1996, p.16

Pakistan's nuclear program carried on with the full knowledge of the United States, and this has led to a great distrust of the United States by policy makers in India since Pakistan's nuclear program is directed solely at India.[114] It was only in 1990 that the United States acted to curb Pakistan when it initiated a complete cut-off of all military and economic assistance.

Pakistan has not given up its attempts to obtain plutonium on the international market. The break up of the Soviet Union in 1991 provided Pakistan with the perfect

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[114] This was discussed in greater detail in Chapter One

opportunity. In August 1994, a German Justice Ministry spokesman in Munich listed Pakistan among the likely destinations for smuggled plutonium.[115] In addition, in late 1995 and early 1996, Pakistan, as was mentioned earlier, attempted to obtain both ring magnets from China for its enrichment plants and a plutonium producing reactor, ostensibly for power generation.

This prompted a flurry of press reports and speculation in India. One extremely interesting interview was with Dr. Raja Ramanna - 'father' of the Indian bomb. When asked why Pakistan would try to obtain smuggled plutonium when it had opted for the U-235 route, he stated:

> My surmise is that if they had plenty of U-235, as they have been claiming for a long time, they wouldn't have gone in for plutonium. From our experience in using centrifuges to enrich uranium, we know that these are very difficult to maintain. And given the state of their industrial capacity, it is apparent that Pakistan's plant is working nowhere [near] to the capacity planned.[116]

Dr. Ramanna's comments bring us to the most important question when dealing with the Pakistani nuclear program: how many nuclear weapons can Pakistan assemble and what types are these likely to be ? Unlike India, where a fair amount of data is available on the performance of the Indian reactors - though this data is far from comprehensive or necessarily accurate - this is not the case in Pakistan. As discussed earlier, no-one is even sure of the capacity of the Kahuta enrichment plant nor is anyone certain of Pakistan's plutonium production capability.

In order to calculate the amount of weapons grade uranium and plutonium in

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[115] S.Gupta, 'Nawaz Sharif's Bombshell',p.28

[116] ibid p.33 The interview was conducted by India Today's features editor Raj Chengappa.

Pakistan's inventory, some estimates have to be made. The accuracy of these estimates is, of course, difficult to gauge. Nonetheless, the assumptions that will be made, are based on the best estimates made by Western experts, chief among them being Leonard Spector. Estimates made by SIPRI on the total amount of nuclear weapons materials have also been used.

Even though Pakistan's Kahuta enrichment began operations in 1984, it is widely believed that weapons grade, that is, highly enriched - uranium was only produced in 1986.[117] As discussed earlier, American official and unofficial sources estimated that Pakistan possessed 100 kg of highly enriched uranium by the end of 1987. This indicates an annual production rate of 50kg U-235 which is enough for three nuclear weapons if 15kg U-235 per weapon is used as a standard.[118]

Using these calculations, and assuming that the plant operated without disruption, Pakistan would have accumulated roughly 500kg of U-235 by the end of 1996, enough for over thirty basic fission weapons. It is, however, highly unlikely that the Kahuta plant operates continuously. As Dr Ramanna mentioned, centrifuges are extremely difficult to maintain and sustain. Despite Pakistan's considerable experience in uranium enrichment, it is likely that Kahuta has experienced problems.

In fact, some analysts, Leonard Spector among them, believe that the production of U-235 at the Kahuta plant was temporarily suspended in 1989.[119] This was done under pressure from the United States and many American experts believe that Pakistan

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[117] Spector, Nuclear Ambitions, p.114

[118] ibid pp.338-339 note 68

[119] ibid p.114

suspended production of enriched uranium from 1990 till fairly recently and that the 5,000 ring magnets was aimed at restoring production of U-235.[120] India, of course, does not accept this assertion.

With regards to plutonium, Pakistan's supplies of Pu-239 are as of now very limited. The Khushab reactor had only commenced construction in the late 1980s. This plant would not have been operational until the late 1990s at the earliest, and given that it takes roughly two years for the material produced to be reprocessed, it is unlikely that weapons grade plutonium contributes much to Pakistan's fissile material stockpile.[121]

However, in the future, the Khushab reactor could produce enough plutonium for two nuclear weapons per year.[122] The plant reportedly under construction at Chasma would produce considerably more, but, plutonium from this plant would not be available before the year 2000.

Pakistan's sole power reactor at Karachi is under IAEA safeguards. However, between September 1980 and March 1983, the IAEA was unable to certify that no diversion of spent fuel to the nuclear weapons program.[123] Again, it must be stressed that the plutonium contribution to Pakistan's nuclear weapons potential is still relatively insignificant. Nonetheless, it has the potential to substantially increase in the next

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[120] A.Haniffa, 'Experts Dubious on Ring Magnet Sales', *India Abroad: February 23 1996*, p.26

[121] It is still not clear if the Khushab reactor is fully operational. See the International Nuclear Safety Centre Database website: http://www.insc.anl.gov

[122] Albright & Zamora, 'India, Pakistan's Nuclear Weapons: All the pieces in place', p.21

[123] Spector, Nuclear Ambitions, p.116 note (d)

decade.

The most recent assessments of the nuclear weapons potential of Pakistan give a much lower figure than the theoretical maximum of over 30 weapons mentioned earlier. The RAND corporation estimated Pakistan's weapons potential at the end of 1995 at about 13 weapons.[124] This does not necessarily represent the number of nuclear weapons actually assembled, but rather the quantity of fissile material available for potential weapons use. The same study gave India the capability to produce 85 weapons at the end of 1995.

With regard to future production levels, the RAND corporation study estimated that by the mid-1990s, Pakistan would be capable of manufacturing two Hiroshima class fission bombs per year.[125] Compare this to India's 100 weapon per year manufacturing potential given in the same report.

Pakistan's potential would come almost exclusively from U-235 production. As mentioned earlier, Pakistan's plutonium production and reprocessing facilities are unlikely to produce significant quantities of weapons grade material until the very late-1990s at the earliest and in all probability not before the beginnings of the 21st century.

Pakistan's nuclear production capacity and fissile material stockpile are much smaller than India's. In addition, Pakistan, despite its apparent possession of a proven Chinese nuclear warhead design, lacks the infrastructure to develop more advanced types of nuclear weapons.

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[124] Haniffa, 'Effect on India of Fissile Cutoff Treaty',p.26

[125] Loc.cit.

As mentioned earlier, Pakistan has attempted, and in some cases succeeded, to purchase beryllium and tritium, which are materials used in advanced nuclear weapons. Pakistan does not yet have the processing equipment needed for the separation of tritium from the deuterium used as a coolant and moderator in its Karachi nuclear reactor. Pakistan has also attempted to produce tritium by irradiating lithium-6 targets.[126] The success of these efforts is not known.

Pakistan's desire for tritium is most puzzling. Pakistan, while possessing an effective design for a fission weapon, has never conducted a nuclear test and as such is short of data. Moreover, Pakistan lacks the computer infrastructure needed to simulate the characteristics of a thermonuclear or boosted fission weapon. Pakistan's attempts to obtain tritium may be an indication of its intention in case it decides to start testing.[127]

Whatever its shortcomings in the field of advanced nuclear weapons, there is no doubt that Pakistan is quite capable of manufacturing a first generation fission weapon without too much difficulty. It has been reported that China supplied Pakistan with details of its fourth nuclear test. However, regardless of China's help, Pakistan has made considerable progress on its own.

Pakistan has tested the non-nuclear high-explosive triggering or implosion package for a nuclear weapon.[128] Using a core of natural or depleted uranium and using X-ray machines, which take split-second photographs of the warhead core, Pakistan

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[126] Albright & Zamora, 'India, Pakistan's Nuclear Weapons: All the Pieces in place', pp.22-23.

[127] ibid p.24

[128] ibid p.21

could have simulated a nuclear blast without difficulty.[129] What is even more interesting is the report by the Pakistani nuclear scientist, Dr. A.Q.Khan, that Pakistan could simulate an atomic test in a laboratory.[130] It may well be possible that Pakistan, during the heightened tension of 1986-87, took the opportunity to conduct a 'cold-test' a basic fission weapon. If Pakistan possesses a proven fission design, its nuclear problems are considerably simplified. All Pakistan would have to do is to obtain sufficient nuclear material necessary for the bomb core and to follow the 'assembly instructions'. The problem, however, is to miniaturize the design.

The problem of miniaturization is particularly important for Pakistan since, as will be shown later, the maximum payload of Pakistan's missiles is 500 kg. It is known that the weapon produced from China's fourth nuclear test weighed 1250 kg. This problem is irrelevant if Pakistan was to rely solely on its strike aircraft as its nuclear delivery system. This aspect of Pakistan's nuclear capability will be discussed later.

Pakistan has a vibrant nuclear program which was born out of the defeat of the 1971 war. This program, after unsuccessful attempts to obtain plutonium reprocessing facilities, has embarked on an extensive uranium enrichment program - with considerable foreign assistance. Pakistan's nuclear weapons potential is still confined to first generation fission weapons - for which a proven design may or may not be available. Some capability for laboratory testing of nuclear weapons exists which may eliminate the need for a test.

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[129] ibid p.22

[130] *The Observer (London)*: March 1 1987

Pakistan's weapons potential is much smaller than that of India. Material for fewer than 20 fission devices exists and the manufacturing capacity is limited to two weapons per year. Nonetheless, Pakistan's potential causes considerable concern in India and may be the reason for the acceleration of the Indian nuclear program in the 1980s.

## *Chapter Three: Delivery Systems - Missiles and Aircraft*

### India's Delivery Systems: Part 1- Missiles

Since the late 1980s, the Indian missile and rocketry programs have attracted considerable attention in the West. This chapter seeks to understand the rationale behind this program as well as the actual performance of the missiles themselves. In more recent times, efforts have been made under the Missile Technology Control Regime ( M.T.C.R.) to restrict and hinder India's advanced rocketry and missile programs. No study of the Indian missile program can ignore the Indian space program. Many items of advanced technology were imported from Western countries for use in satellite launch vehicles and were then used in missiles. Moreover, many of the scientists involved in the missile program, including the project director, were trained in the West and later gave the initial impetus to the Indian space program and the later missile projects.

This section will examine the development of the Indian rocketry program. The role of Western technology transfers will be examined in the development of advanced Indian rockets. The emergence of a dedicated missile program in the 1980s will be seen in terms of a desire to achieve a degree of self sufficiency in missile design and production. The section will conclude with an assessment of the current state of the Indian missile program and on the 'Prithvi' and 'Agni' systems in particular and on the progress of the Indian space rocket program. The impact of the M.T.C.R. will be dealt with in relation to the missile program.

India's rocketry project really in the 1960s when the United States assisted the

Indian space program by launching a small scientific sounding rocket in 1963 in India.[1] It also helped to design and build the Thumba test range from which over 350 American, British, Soviet and French rockets were eventually launched.[2] India's first rockets were supplied by the French who sold India a production license for the 'Centaure' sounding rocket from the late 1960s,this rocket is still used by India.[3]

During the 1960s, Indian engineers studied extensively in the United States. Among them was a man who has now become a minor celebrity in India, Dr. A.P.J.Abdul Kalam. Between 1963 and 1964, Dr. Abdul Kalam spent four months in the United States studying at N.A.S.A.'s Langley Research Centre in Virginia.[4] This centre was the site for the development of an advanced satellite launching rocket, the 'Scout'. Dr. Abdul Kalam was able to accumulate much material on the unclassified rocket and was able to observe the design and testing procedures involved.[5] He was able to put this knowledge to good use in later years.

India's first foray into the field of missile design came in the 1970s. The little known 'Devil' project was initiated with the aim of producing a 130 km range surface to surface missile. Since the early 1970s, India had been attempting to indigenise and modify the Soviet SA-2 surface to air missile so as to make it less vulnerable to

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[1] W. Burrows & R. Windrem, 'Our God can Lick your God', *India Today: Feb. 28 1994*, p.58 extracted from Critical Mass( New York : Simon and Schuster Ltd., 1994)

[2] Loc. cit.

[3] G.Milhollin, 'India's Missiles - With a Little Help from Our Friends', *The Bulletin of the Atomic Scientists: Nov.1989*, p.32 ( Sounding Rockets fly straight into the atmosphere to conduct scientific experiments )

[4] Loc. cit.

[5] Burrows & Windrem, 'Our God can Lick Your God', p.58

electronic counter measures. It is not known whether missiles were indigenously produced, but the existing Indian Air Force SA-2 squadrons were modernized to reduce their vulnerability to E.C.M. The SA-2 was also selected as the basis of the 'Devil' project. Experiments were made with the propellant compounds of the SA-2 and missiles were actually successfully fired. However, the project was abruptly terminated when the Indian Air Force, the intended user of the missile, rejected the system.[6]

Throughout the late 1970s and the early 1980s, there was no coherent project for Indian missiles. However, the space program had ambitious plans for launching satellites and continued to acquire advanced technology from Western countries - namely France and West Germany. The French contribution was principally in the field of liquid fuel propulsion. Under a license from France, India obtained the technology for the 'Viking' high-thrust liquid rocket engine. Indian engineers actually helped develop the 'Viking' during the mid-1970s and then began building a version of its own - the 'Vikas'.[7]

American and French assistance is supposed to have been dwarfed by the help provided by the West Germans to the Indian Space Research Organization ( ISRO ). Gary Milhollin, a long time critic of India, asserts that the Germans gave India vital assistance and technology in the fields of rocket guidance and testing and on the use of composite materials for heat shields and nozzles.[8]

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[6] R.Chengappa,'The Missile Man',*India Today: April 15 1994*,p.44

[7] Milhollin, 'India's Missiles - With a little help from our friends', p.32

[8] Loc. cit.

The West German aerospace agency, D.L.R., began training Indian personnel in rocket guidance from 1976.[9] The first step was taken in 1978 when an Indian sounding rocket was tested with a German interferometer. The program was later expanded to include an on-board D.L.R. microprocessor . An Indian version of the same interferometer was successfully tested in April 1982.[10] Milhollin also claims that the Germans later helped India develop an inertial navigation system, ostensibly for guiding satellites.[11] D.L.R. was supposed to have provided India with the technology for conducting high altitude rocket simulation tests and sold India large quantities of sophisticated electronics and computers for rocket payload guidance and software for satellite orbital analysis.[12] Finally, D.L.R.'s extensive collaboration with ISRO was allegedly rounded off with massive assistance in the development of carbon composites for use on rocket nozzles and on heat shields for re-entry vehicles.[13] This, Milhollin supposed gave India the necessary infrastructure for an extensive and sophisticated guided missile program. These claims must be examined more closely as Milhollin's assertions, though widely quoted and accepted, are not wholly accurate.

Professor Milhollin has overlooked the West German government's rebuttal of his claims.[14] His arguments were dismissed as unproven suppositions by D.L.R..

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[9] Loc. cit.

[10] Loc. cit.

[11] Burrows & Windrem, ' Our God can lick your God ' p. 60

[12] Loc. cit.

[13] Loc. cit.

[14] Chellaney, Nuclear Proliferation, p.285

Milhollin overstates the importance of Western assistance to the Indian space and missile programs. For example, his assertion that the company APC-Rex with providing India with autonomous navigation technology for satellites, which he contends was later adapted for rockets, does not seem plausible.[15] APC-Rex was apparently a small program involving experiments with technical and scientific payloads produced by both Germany and India. It seems inconceivable that this could have been of any use in developing inertial guidance systems.[16] Moreover, Milhollin has also made several unsubstantiated claims. His comments regarding the 16-bit microprocessor is unsourced. Both the West German government and D.L.R. have also strenuously denied that any of the India - German space collaboration could have been used to develop a ballistic missile.[17]

Nonetheless, Milhollin does have a fairly interesting case. West German export controls on missile and rocket technology previously have been shown to be incredibly lax. Given the close cooperation between the Indian space program and the German space agencies, it is most likely that at least some technology necessary for the manufacture of missiles were obtained by India from the Germans. What is less clear is whether or not India intended to develop missiles using this technology when it initially entered into cooperation with the Germans.

India scored its first rocketry success on July 18 1980 when the I.S.R.O. placed

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[15] ibid pp.285-286

[16] ibid p.286

[17] Loc.cit.

into orbit an Indian satellite called the 'Rohini'.[18] The launcher used was the S.L.V.-3, which was derived from the 1960s 'Scout' rocket - and theoretically gave India the capability to develop Intermediate Range Ballistic Missiles (I.R.B.M.s). The S.L.V.-3 project was led by Dr. Abdul Kalam but, there is no evidence that India was seriously contemplating the development, much less the deployment, of such missiles at that time. However, the Indian government was to sanction a full-fledged missile development program shortly afterwards.

The Integrated Guided Missile Development Program (IGMDP) was approved by the Government of India in Fiscal Year 1983-1984 with the aim of developing a wide range of guided missiles.[19] The program was initiated in response to the reluctance of India's arms suppliers, including the Soviet Union, to supply more advanced missiles. The prohibitively high cost of advanced missiles was also an important factor. The Indian government decided that the indigenous missiles would not only incorporate the latest technology, but would also be independent of imported critical parts.[20]

The IGMDP was placed under the control of the Defence Research and Development Laboratories ( DRDL ) headquarters at Hyderabad and its newly appointed director - none other than Dr. A.P.J. Abdul Kalam.[21] The government also gave DRDL a rather unusual directive: the design-production-deployment cycle was to

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[18] *Vayu Aerospace Review: III/1992*, p.5

[19] I. Banerjie, 'The Integrated Guided Missile Development Program', Lt.Gen.M.Thomas ed. *Indian Defence Review: July 1990*,p.99

[20] Loc. cit.

[21] Chengappa, 'The Missile Man', p.44

be drastically shortened from the usual 10-15 years to 8-10 years.[22] This entailed a far greater degree of organizational and technical innovation than had ever been displayed by an Indian defence development establishment.

Kalam anticipated that the Western countries would, sooner or later, impose strict controls on the supply of critical missile components to developing countries. The project staff at DRDL adopted a two-pronged strategy - to buy whatever they could immediately and develop the rest indigenously.[23] This gave the Indian missile program a head-start over the M.T.C.R. which came too late to seriously hinder the IGMDP.

Five key technologies were identified for indigenous manufacture, including phase shifters for radars and sensors for guidance systems.[24] Many others, such as carbon composites for re-entry vehicles, were obtained from I.S.R.O. which, as discussed earlier, obtained the technology from Western countries. Kalam, with an I.S.R.O. background, was able to obtain a great deal of technology and testing facilities for India's missiles from India's space program. In addition, he ensured that the Indian military was closely involved with the IGMDP from the outset. This ensured that the missiles were developed to meet the requirements of the armed forces, thus reducing the chance of rejection, the fate which befell the earlier 'Devil' project.

The IGMDP initially concentrated on the design of four missile systems. The first two systems, a short range surface-to-air missile and a battlefield support missile, were selected because they did not require any great innovation in design or

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[22] Banerjie, 'The Integrated Guided Missile Development Program', p.99

[23] Chengappa, 'The Missile Man', p.44

[24] Loc. cit.

construction. More time was allocated for the development of an advanced medium range S.A.M. and a state-of-the-art anti-tank missile which were to be extremely advanced and comparable to the latest technology available in the West.[25] Later, DRDL was assigned the task of designing and developing an I.R.B.M. class test vehicle.[26]

A mere two years after the initiation of the program, the first flight test of the 'Trishul' short range S.A.M. took place in September 1985.[27] This was followed by the 'Prithvi' ballistic missile on February 25 1988. The launch of the Prithvi was not only seen as an achievement for the IGMDP but as a national achievement. The Indian Parliament interrupted its normal routine to receive news of the successful test.[28] However, this excitement paled in comparison which greeted the launch of DRDL's I.R.B.M. test vehicle on the 22nd. of May 1989.

The test of the I.R.B.M. 'Agni' was greeted with consternation in the West and jubilation in India. The system basically consisted of a Prithvi missile attached to the first stage of the SLV-3 rocket.[29] Since the SLV-3 was itself closely based on the U.S. 'Scout', the test of the 'Agni' was a clear sign that the M.T.C.R. needed to be strengthened. Moreover, given India's active nuclear weapons program, the 'Agni' was seen as a potentially destabilizing development in the South Asian region.

While the 'Prithvi' was openly declared to be a 'military' missile, the 'Agni' was

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[25] Banerjie, 'The Integrated Guided Missile Development Program', pp.99-100

[26] Loc. cit.

[27] ibid p.101

[28] S.Gupta 'Shooting Ahead' *India Today: March 31 1988*, p.96

[29] Burrows & Windrem, 'Our God can Lick Your God', p.60

termed a 'technology demonstrator'. The latter program seems to have been accorded a much lower priority than the other missiles in the IGMDP since only three tests of the 'Agni' have been made. These ballistic missile programs will be examined in more detail, but first, some mention should be made of the other three missiles currently under development.

The two S.A.M.s under development, the 'Trishul' and the 'Akash' , are slated for deployment from 1996, following the user trials currently underway.[30] The 'Trishul' has a range of 9km. and is a low-level, quick reaction S.A.M. designed to replace Soviet-made SA-8 systems in service with the Indian armed forces.

The 'Trishul' is a self-contained, mobile system with an on-board fire-control radar. The system has four guidance options, which are, active and semi-active radar homing, infra-red and a sophisticated home-on-jam (HOJ) option.[31] The 'Akash' is a much larger system with a similar range of guidance options. However, the missile is tied to a phased-array radar capable of tracking 64 targets at up to 60km and the system is capable of tracking and engaging ballistic missiles as well as aircraft.[32] Both systems are claimed to be highly resistant to electronic counter measures.

The final system under development is the 'Nag' anti-tank missile. Designed to defeat the heaviest armour at ranges of up to 5km, the 'Nag' has an advanced guidance system that incorporates a passive infra-red seeker in addition to an active millimetric-

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[30] A.Singh, 'Akash, Trishul set for trials', *Hindustan Times: May 29 1994*, p.1

[31] J.Baranwal, SP's Military Yearbook 1992-1993, p.413 ( New Delhi: Guide Publications, 1993 )

[32] Chengappa, 'The Missile Man', p.43

wave seeker.[33] This gives the missile a formidable 'fire and forget' capability.

These programs have not attracted the kind of attention given to the 'Prithvi' and 'Agni' projects. Like the ballistic missile programs of other developing countries, these two Indian systems have become linked to the Indian nuclear weapons program and the United States has made some efforts to pressure India not to deploy the missiles. However, no Indian government can be seen to give in to American pressure on these missile programs since the program seems to have become a symbol of national pride.

The 'Prithvi' is a mobile heavy battlefield support system with a range of 150-350km and a payload of 500kg to 1000kg.[34] The system is mounted on an 8 *x* 8 wheeled transporter-erector-launcher ( T.E.L.), based on a Czechoslovak TATRA truck chassis.[35] The utility of these tactical S.S.M.s depends on the nature of the payload carried and on the accuracy. The 'Prithvi' has a payload sufficient for a nuclear, biological or chemical warhead, but, based on all the information published so far, India is currently deploying the system only with conventional warheads.

Five interchangeable warhead types are to be fitted to the 'Prithvi', including a high explosive ( H.E.) monolith, a pre-fragmented anti-personnel warhead, cluster submunition bomblets for use against armour and the 'Type 77' fuel-air explosive ( F.A.E.).[36] The missile is supposed to be able to manoeuvre up to 15 degrees in flight as

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[33] A.Dixit, 'Indian Defence Industry Programmes', *Military Technology: 12/1994*, p.23

[34] D.Lennox, 'Ballistic Missiles hit new heights', *Jane's Defence Weekly: 30 April 1994*, p.24

[35] Banerjie, 'The Integrated Guided Missile Development Program', p.104

[36] Gordon, India's Rise to Power, p.86

well as being 'highly accurate'.[37] Published figures give the C.E.P. of the 'Prithvi' as less than 250m at maximum range;[38] however, other estimates in fairly authoritative sources, give the C.E.P. as 100m.[39] The discrepancy in these two figures has not been fully explained. It should be pointed out, however, that in the early years of the flight test program, many skeptical analysts had a tendency to downplay India's abilities in the missile field. It is unfortunate that these tendencies still continue, in some Western circles, at any rate, to this day in spite of evidence to the contrary. Another more interesting report from the last two tests of the 'Prithvi' gave the C.E.P. of the missile as an incredible 10m![40] The latter figure was achieved at a range of 67km after the missiles were fired from pre-surveyed sites. If the system is fired from an unsurveyed site, the accuracy is estimated at 150m at a range of 150km. Whatever the actual figure, the 'Prithvi' is considered to be quite accurate.

A more advanced version of the basic 'Prithvi' has recently been tested. On 27 January 1996, the 'Prithvi-II' was tested. This has a range of 250-350km and a payload of between 500 and 1000kg.[41] Of even greater significance is that its C.E.P. is estimated at a mere 50m at maximum range. This could be due to the fact that a terminal guidance

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[37] Loc. cit.

[38] C.V.Gole, 'The "Prithvi" - Facts and Fancies', *Vayu Aerospace Review IV/1994*, p.26

[39] S.Bhaduri, 'Weapons Overview - "Prithvi" SS-150', Maj.Gen. A.Karim ed.*Indian Defence Review: October 1992*, p.101

[40] P.Sawhney, 'Whether the US likes it or not, the race has begun in South Asia', *The Asian Age: 23 March 1995*,p.13
These missiles were launched from a pre-surveyed site at a target 67km away.

[41] R.Chengappa, 'Boosting the Arsenal', *India Today: 29 Feb.1996*, p.98

system is being developed for this version of the 'Prithvi'.[42] This terminal guidance system is similar to the one currently being developed for the 'Agni' IRBM. These guidance systems significantly enhance accuracy.

The 'Agni' is a much larger system with a range of 2500km and a payload of 1000kg.[43] However, it is not at all certain that the 'Agni' is a military missile or a 'technology demonstrator', as claimed by Indian officials. As mentioned earlier, the 'Agni' is an amalgam of the 'Prithvi' and the SLV-3. It is highly possible that the 'Agni' is a cheap test vehicle for re-entry and guidance technology for use on a more advanced platform.[44]

The last test of the 'Agni', which took place on 19 February 1994, appeared to be a major technical breakthrough for India. The system tested included a maneuverable re-entry vehicle for increased accuracy with terminal guidance.[45] This terminal guidance system is reported to be comprised of a scanning correlation optical system based on a scanning focal plane homing head in the infrared and millimetric wavelengths of the electromagnetic spectrum.[46]

Dr. Abdul Kalam states that the missile can be fully deployed within two years.[47]

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[42] Loc.cit

[43] Gordon, India's Rise to Power, p.87

[44] ibid p.88

[45] Chengappa, 'The Missile Man',p.40. While there were reports in 1993 that were highly sceptical of India's ability to test such a system, there have been none since the actual test.

[46] Sawhney, 'Standing Alone', p.28 This system would be difficult, though not impossible, to evaluate over water.

[47] Chengappa, 'The Missile Man' p.42

Kalam also asserts that the 'Agni' is ready for serial production while some simultaneous development flights aimed at achieving a much greater performance are undertaken.[48] Kalam claims that no further test flights are necessary for the basic 'Agni' system and that it is ready for production. More flights would be necessary only to improve the design - an 'Agni Mark II'.

Having overcome these technical problems, India could be in a position to deploy a fully developed missile system based on the guidance technology of the 'Agni' and on the booster technology of India's Polar Satellite Launch Vehicle (PSLV) - successfully tested in October 1994.[49] Since the Indian missile program has in the past drawn heavily from the technology of the Indian space program. There is no reason why this will not happen in the future. It should be noted that a missile based on the PSLV will have the range and payload of a powerful I.C.B.M.

The Indian space program has recently scored a number of successes which may be relevant to the missile program in the future. The space program has also attracted the attention of the United States because of its attempts to acquire cryogenic rocket engines from Russia.

Between 1992 and 1994, India successfully tested two satellite launch vehicles. On 20 May 1992, and again on May 4 1994, a boosted version of the SLV-3, the Augmented Satellite Launch Vehicle (ASLV), was successfully launched.[50] This was

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[48] 'Indigenous Missile Development Program to Continue', *India Abroad: August 30 1996*, p.21

[49] Gordon, India's Rise to Power, p.91

[50] *Vayu Aerospace Review III/1994*, p.7

followed by the launch of the 283 ton PSLV, mentioned earlier, on 15 October 1994. The PSLV launch confirmed all the technologies needed to produce a ballistic missile with a range of tens of thousands of kilometres.[51] It may be of interest to note that the second stage of the PSLV is powered by the 'Vikas' engine - the Indian version of the French 'Viking'.

In 1992, the United States government imposed sanctions on ISRO after a contract was signed with the Russian Glavkosmos space agency for the supply of cryogenic engines and the technology for their manufacture in India.[52] The American government claimed that the deal violated the terms of the MTCR and that the cryogenic engines would be used for military purposes. Unfortunately for the Americans, delaying India's cryogenic project is not going to halt the missile program.

The satellite launch vehicles could be used as the basis for much longer range ballistic missiles. The ASLV, in particular, which is in effect an SLV-3 with boosters, could, without any difficulty ( or necessarily any testing ) be used to enhance the range of the 'Agni' IRBM to a range of close to 5000km. The GSLV, despite the claims of many Western analysts, is unlikely to be used as a missile. Should India decide to develop an ICBM, then the PSLV would be the basis of any such missile. The characteristics of possible ballistic missiles based on the ASLV and PSLV with the existing 'Agni' and 'Prithvi' are shown below:

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[51] V.Singh, 'Making a Mark', *Flight International 16-22 Nov.1994*, p.29

[52] *Vayu Aerospace Review II/1992*, p.4

| System | Range | Payload | Status |
|---|---|---|---|
| Prithvi I | 150km | 1000kg | In service |
| Prithvi II | 250km | 750-1000kg | 2 successful tests |
| Prithvi III | 350km | 750kg | Development |
| Agni | 1500-2500km | 1000kg | 3 test flights - 2 successful - Tested to 1450 km |
| ASLV | 4500km + | 1000kg | 2 successful flights |
| PSLV | 8000km+ | 1000kg+ | 2 successful flights |

Source:CDISS website -www.cdiss.org:80/countrya.htm#INDIA

At the time of writing, the 'Prithvi' is the only ballistic missile entering, or in service. In 1993, an initial deployment of the system was made with 11 Corps of the Indian army.[53] While India continues to assert that the missile is not yet deployed or in production, there is clear evidence that missiles are being deployed but away from the border in central India. This enables India to say that the missiles are not 'operational.[54]

Command, control and targeting are essential or the use of ballistic missiles against military targets. While India possesses limited satellite reconnaissance capability for targeting area targets for long range IRBMS, tactical targeting for the 'Prithvi' will be done with Israeli unmanned aerial vehicles and similar Indian types.[55] As of now, 32

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[53] ' "Prithvi" missile inducted into Army ', *Hindustan Times: May 22 1993*, p.1

[54] 'A Quiet Launch', *India Today: June 30 1994*, p.93

[55] R.Bedi, 'India to buy pilotless Israeli spy planes by end of '94', *The Asian Age: September 16 1994*,p.4

'Searcher' UAVs have been obtained pending the introduction of the Indian developed 'Nishant' UAV.[56]

The initial user of the 'Prithvi' is the Indian Artillery Corps with the 333 Missile Group being the first unit to receive the type.[57] The group consists of three SSM sub-groups, each with four launchers and a support sub-group with warhead change vehicles and missile reloads. Survey and meterological sections are also attached.

It is not known how many reloads will be allocated per launcher. This will only be known by the Corps and Army commanders. The numbers will,of course depend on the roles assigned to the 'Prithvi' in Indian army service. Although the Indian army has issued manuals on the deployment of the 'Prithvi', its use has not been made clear. It is clear, however, that the Indian army believes the 'Prithvi' to be a viable tactical weapon. The Regiment of Artillery has started training personnel to operate the system and has developed a sophisticated simulator to assist in this task. Nonetheless, there are some major concerns regarding the availability of adequate storage space for the missiles already produced.

Currently stationed at Secunderabad and now part of 30 Artillery Division, 333 Missile Group, and the proposed 444 and the planned 555 Missile Groups, have the following organization:[58]

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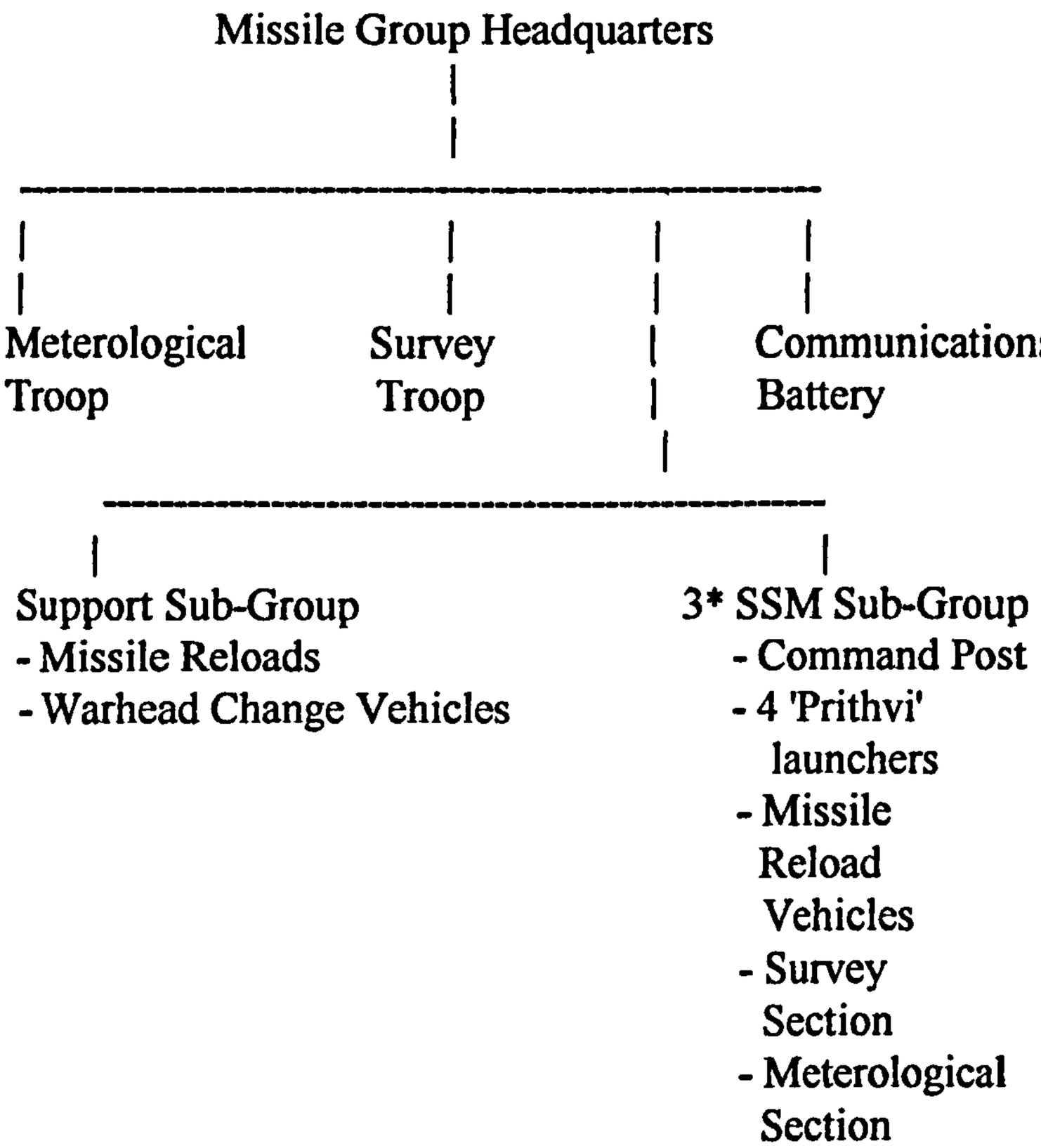
[56] S.Unnithan, 'India may buy Israeli Missile' in *Indian Express: 6 January 1997*

[57] P.Sawhney, ' Army raises Prithvi Group ', *The Asian Age: 29-30 April 1995*, p.1

[58] P.Sawhney,'India's Artillery is a Force in its own right' *Jane's Defence Weekly: 9 October 1996*, p.35




How this tactical organization will work on the battlefield has not been released. More importantly, there is no clear indication of who will have the authority to deploy and employ the 'Prithvi' in combat.[59] This may not be particularly significant if the missile is to be deployed with solely conventional warheads, but is extremely important in the event that 'Prithvi' is seen as a nuclear weapons delivery system.

In the case of the 'Agni' there is even less information available as to how it will be controlled. It is not clear as to which service will operate a missile system based on the 'Agni', though an Indian Air Force Strategic Air Command has been mentioned. The 'Agni' presents a whole variety of new problems and requires an entirely new and more

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[59] There are some indications that the authority will lie with Army Headquarters.

developed C3I network than currently exists. .

The development and production of the 'Prithvi' and the development work conducted on the 'Agni' provide India with the potential to deploy nuclear armed missiles. As mentioned in the section on nuclear capabilities, India has the ability to manufacture smaller and lighter nuclear warheads which can be fitted onto ballistic missiles. The development of enhanced-fission weapons adds a new dimension to any missile based deterrent. Should India choose to develop ICBMs, based on the PSLV, these could conceivably be deployed with warheads in the 100-150 kiloton range. India is also known to be conducting research into multiple warheads which could see the eventual deployment of ICBMs and IRBMs with MIRVs.[60]

One question remains unresolved. Both the 'Prithvi' and the 'Agni' are capable of carrying weapons of mass destruction.'Prithvi' regiments may be placed under the control of the Corps commanders and missiles based on the 'Agni' may come under the Indian air force. Is the Indian government going to give sole control of such weapons to the military? The Indian political establishment has a very distant, and at times strained, relationship with the military. The military, in turn, is held in extremely high esteem by the Indian populace and is 'trusted' a lot more than the political establishment. It should also be pointed out that the un-elected Indian President is Commander-in-Chief of the Indian armed forces and not the elected Prime Minister.

The Indian missile program has made considerable progress since its initiation. It has been shown that foreign technology may have been instrumental in giving India the

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[60] Gordon, India's Rise to Power, p.90

basic infrastructure needed. The Indian missile program has effectively defeated the MTCR and rendered it ineffective. Whether India will move to deploy IRBMs or ICBMs with nuclear warheads has become increasingly dependent on political decisions rather than capability, and any moves in this direction will be closely watched by India's neighbours and the wider international community. The missile program has become a symbol of national pride and will not be halted.

Dr.Abdul Kalam, the founder and chief advocate of India's missile program once said: 'now no embargo can do anything to us. The MTCR has been rendered harmless. It can't even scratch us leave alone throttle our program.[61] This quote summarizes both the rationale and the success of the Indian missile program. India has achieved a high degree of self-sufficiency in missile design and production and in so doing has rendered the MTCR virtually useless as far as India is concerned.

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[61] Chengappa, 'The Missile Man', p.42

## Delivery Systems: Part 2 - Aircraft

It is widely known that India operates large numbers of nuclear capable strike aircraft. However, when discussing possible systems, aircraft are too often mentioned only in passing. In the India-Pakistan context, it is possible that aircraft, and not missiles, will be the primary delivery system. The Indian Air Force, currently the fourth largest in the world, operates no fewer than sixteen squadrons of nuclear capable strike aircraft. These comprise five Jaguar squadrons, eight MiG-27M squadrons and three MiG-23BN squadrons - numbering well over three hundred aircraft.[62]

The MiG-23BN squadrons are probably earmarked for the Offensive Air Support (OAS) role and can thus probably be discounted for the nuclear strike role. Some of the MiG-27 squadrons are also earmarked for the OAS task, however, the Indian MiG-27Ms are fitted with a RSBN-6S navigation system which is associated with the nuclear strike role.[63] Mikoyan has openly acknowledged that the MiG-27 is nuclear capable.[64] The Jaguars are also known to be capable of carrying nuclear weapons. The 'toss-up' technique used to deliver nuclear weapons was practiced by IAF aircraft during exercise 'Hammerblow' in 1988.[65] Given India's ability to manufacture smaller nuclear weapons,

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[62] This figure is a composite from available sources, one of the best being C.V.Gole 'The IAF in 2001' in *Vayu Aerospace: I/1994*, p.42 However, in the early 1990s, two squadrons converted to the MiG-27, including one from MiG-23BNs. MiG-27 squadrons are Nos.2,9,10,18,20,22,29 & 222. MiG-23BN sqns. are Nos.31,220 & 221. Jaguars operate with Nos.5,6,14,16 and 27 sqns.

[63] D.Donald & J.Lake, Encyclopaedia of World Military Aircraft: Volume Two (London:Aerospace Publishing Ltd., 1994)p.305

[64] ibid p.305. Nuclear Weapons were listed between 500kg bombs and napalm canisters!

[65] R.Rikhye, P.Singh & P.Steinemann, Fiza'Ya: Psyche of the Pakistan Air Force ( New Delhi: S.A.S., 1991), pp.163-164

India's strike aircraft assume an even greater importance.

It is likely that a few squadrons will be earmarked for an emergency nuclear role rather than a permanent nuclear alert system with its requirements for a sophisticated command structure. Given the Indian army's need for air support, plus interdiction and attacks against special targets, the MiG-23/-27 squadrons are likely to be fully occupied. It is, therefore, probable that the main nuclear strike aircraft will be the Jaguar, with support from whatever MiG-27Ms that can be spared. It should be noted that even the vast fleet of Indian MiG-21 combat aircraft can theoretically be used for nuclear strike role. These aircraft would have a very limited range and payload and as such cannot be seriously considered as candidates for this very demanding and sensitive role. The ongoing, and very comprehensive, upgrade program for the MiG-21bis aircraft of the Indian Air Force will add little to their ability to deliver nuclear weapons. The Mirage 2000 fleet of the Indian Air Force could also be diverted for the nuclear strike role, but these have air-superiority as a major role.

The recent purchase of Sukhoi Su-30MK (I) aircraft and the technology transfer agreement to enable their manufacture in India is highly significant.[66] However, since the Su-30 was originally designed as a long-range interceptor, it is unclear as to how the Indian Air Force intends to use them. The Su-30 can, however, carry a very heavy weapons load - including nuclear weapons - over a very long range.

The strike aircraft available to the Indian Air Force have combat radii of up to

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[66] The Sukhois were purchased in 1996 and an agreement in principle has been signed to permit manufacture in India. The terms of the manufacturing agreement have not yet been finalised and probably will not be finalised until the final production variant - Su-30MKI emerges. See *Vayu Aerospace Review:* II/1997, p.5

850km. The Jaguars are the longest ranging aircraft in the IAF inventory while the MiG-23/-27 family are most useful at shorter ranges. All three aircraft types are equipped with sophisticated weapons aiming and delivery avionics and can carry substantial weapons payloads at supersonic speeds at low level. The characteristics of the three major types of Indian strike aircraft can be outlined below:

| Aircraft Type | Quantity | Weapons aiming systems | Payload | Combat Radius |
|---|---|---|---|---|
| SEPECAT 'Jaguar' | 5 sqns = 110 | DARIN - all weather attack & ranging system. | 2* R-550 'Magic' AAMs + 4500kg ext. stores | 852km on hi-lo-hi mission on internal fuel - 537km on lo-lo-lo mission with int. fuel. |
| MiG-27L 'Flogger-J' | 8 sqns = 200 | PrNK-23 weapons aiming & release system + RSBN-6S navigation system. DARIN system being added. | 2* R-60 AAMs + 4000kg ext. stores | 540km on lo-lo-lo mission with ext. fuel - 225km on lo-lo-lo mission on int. fuel |
| MiG-23BN 'Flogger-H' | 3 sqns = 70 | PrNK-23 nav/attack system. | 2* R-60 AAMs + 3000kg ext. stores | 400km on lo-lo-lo mission with ext. fuel |
| **TOTAL Number of Strike Aircraft** | **380** | | | |

Sources:[67] B.Gunston, The Osprey Encyclopedia of Russian Aircraft: 1875-1995 ( London: Osprey, 1995 ) & D. Donald & J. Lake, Encyclopedia of World Military Aircraft (London: Aerospace, 1994)

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[67] This table was compiled from the sources listed by the author.

When looking at the characteristics of any strike aircraft, a number of very important factors must be taken into account. The combat radius of any combat aircraft can be significantly expanded by the use of external fuel tanks or by reducing the weapons load, or by a combination of the two. Two air-to-air missiles are usually carried for self-defence.

The above aircraft can carry and deliver nuclear weapons and, at least in the case of the MiG-27 & Jaguar, there is some shielding of the aircraft navigation and attack systems against the Electro-Magnetic Pulse ( EMP ) effect that is produced by the detonation of a nuclear weapon.[68] The fact that both the Jaguar and MiG-27 had important nuclear roles in ther countries of origin lends credibility to the assertion that these two aircraft types will form the backbone of any Indian aircraft based nuclear strike component.

India's MiG-27 fleet also carries a comprehensive range of computer managed internal ECM equipment to increase its chances of penetrating hostile airspace.[69] The Jaguars also have some ECM equipment, but this is currently being enhanced with the

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[68] The RSBN-6S fitted to the MiG-27 is optimised for and associated with the nuclear strike role. The DARIN system in the Jaguar is almost certainly optimised for the nuclear role since both the British and French used the aircraft for the nuclear strike role. The French, in particular, widely used the single-seat Jaguar-A as a nuclear strike aircraft - 2 sqns with a single AN 52 on the centreline pylon - while four RAF nuclear strike sqns ( Nos.14,17,20 & 31 ) used the single seat GR.Mk.1. India's Jaguar Internationals are equipped to a much higher standard than Jaguars of either Britain or France.
see Donald & Lake, Encyclopedia of World Military Aircraft: Volume 2, pp.376-379

[69] B.Gunston, The Osprey Encyclopedia of Russian Aircraft: 1875-1995 ( London: Osprey Publishing Ltd., 1995 ), p.216

purchase of ECM equipment from Israel.[70] The MiG-23s, however, while having considerable electronic warfare equipment, are not up to the same standard as the other two aircraft types.[71]

## Conclusions - India's nuclear capability & delivery systems

India has the capability to deploy a very substantial nuclear arsenal in a fairly short period of time. At present, delivery systems will consist of manned aircraft - especially Jaguars - and Short Range Ballistic Missiles (SRBMs) like the 'Prithvi'. However, in the next few years, this situation could change quite dramatically.

As this chapter has shown, India has the technical capacity to manufacture both IRBMs & ICBMs. It is possible that the Indian nuclear arsenal would go from 85 fission weapons delivered by Jaguars/MiG-27Ms & a few 'Prithvis' in 1995 to well over two hundred fission and enhanced fission warheads (100-150kt) mounted on IRBMs & ICBMs, possibly with MIRVs, within the next decade.

It is not known whether or not India has overtly deployed or will deploy, nuclear weapons. This is now a political, and not a technical matter and only time will tell which way India decides. The other option is for India to continue with its current policy of nuclear ambiguity but with a slight twist - instead of an undeclared, unweaponized arsenal - India could move, without anyone noticing to possessing an undeclared, but **fully weaponized** nuclear arsenal. India's options are wide open.

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[70] 'India is close to ordering Israeli Radar Jammers', p.19 in *Flight International: 10-16 January 1996*

[71] Gunston, Encyclopedia of Russian Aircraft, p.215

## Pakistan's Delivery Systems:Part 1 - Missiles

When dealing with the Pakistani missile program, one is faced with the same problems as with the Pakistani nuclear program. There is considerable confusion over the state of the indigenous Pakistani program. It remains uncertain if either of the two Pakistani missiles, 'Hatf-1' and 'Hatf-2' have actually entered production. Moreover, there has been a recent flurry of rumours concerning the transfer of Chinese M-11 missiles to Pakistan, and reports that China is helping to construct a missile manufacturing plant. Pakistan's space program plays virtually no role in its missile program. Unlike India, the Pakistani space program possesses very limited capabilities and is incapable of assisting in any meaningful way. Since neither Pakistan nor China admits to the presence of M-11 missiles - in fact they both strenuously deny it - the accuracy of some elements can be called into question.

The Pakistani missile program first came into prominence in 1989, roughly a year after the first launch of the 'Prithvi', when it was announced that Pakistan had flight tested two surface-to-surface missiles. On 11 February 1989, Pakistan claimed that two SSMs, one with an 80 km range and the other with a 300 km range, each carrying a 500 kg payload, had been successfully tested.[72]

There is no evidence that Pakistan continued with as vigorous a testing program as the Indians did with 'Prithvi'. In fact, Leonard Spector has made particular note of this point.[73] The missiles, the 'Hatf-1' 80km range system, were displayed at the Joint

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[72] Spector, Nuclear Ambitions, p.341, note 82

[73] ibid p.103

Services Parade in Islamabad in 1989.[74] It is, however, almost inconceivable that the system could have been fully operational at this time. These missiles are roughly comparable to the ex-Soviet 'Scud' and FROG families. While their payload of 500kg has been confirmed, no information has been released regarding their accuracy. There has also been no mention of what types of warheads have been considered for use. Without this information it becomes difficult for any clear assessments to be made regarding their military use.

One thing, however, is abundantly clear, the 'Hatf-1' appears to have a limited capability and with a range of 80 km, it has very limited flexibility. The 'Hatf-2' seems to have been supplanted by imported Chinese M-11 missiles. Indian analysts are uncertain whether or not the 'Hatf-2' project continues since there have been no reports of tests or deployment for several years. This system, with a range of 300 km and a payload of 500kg, is claimed to be comparable to the Indian 'Prithvi' in size and potential. However, without undergoing at least a few more tests, it is highly unlikely that the system is anywhere near ready for induction.

What is more remarkable is that the Chinese M-11 missile bears a striking resemblance in performance to the elusive 'Hatf-2'. The reported transfer of these M-11 missiles to Pakistan has dominated the news about Pakistan's missile program.

Reports of the transfer of Chinese missiles have frequently featured in the Indian press and in fragmentary reports from the United States intelligence agencies. It now appears clear, however, that some M-11 missiles have been obtained from China. After

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[74] *Jane's Defence Weekly: 15 April 1989*, p.635

considerable reluctance, the U.S. government now appears willing to admit that about 30-60 M-11 missiles as well as 5,000 ring magnets for the Kahuta enrichment plant have been delivered to Pakistan.[75]

There are also reports that the Chinese are also helping to construct a ballistic missile manufacturing plant near Rawalpindi.[76] This is clearly aimed at solving one of Pakistan's biggest problems - India's numerical missile superiority. While Pakistan possesses a few M-11 missiles and may have a number of 'Haft-1' systems, it lacks any large scale manufacturing capacity. This is critical since, if the 'Hatf-1' and M-11 systems are to be used with conventional warheads, substantial numbers will be needed.

Using the Pakistani missiles with nuclear warheads presents a entirely different problem. While some reports have indicated that the Chinese nuclear design allegedly passed on to Pakistan weighed only 180 kg,[77] other, more recent sources suggest that the Chinese design was actually from their fourth atmospheric test, which was used to provide the warhead of the 'Dong Feng-2A' missile.[78] If this is true, this would have weighed over 1000 kg. This is much greater than the payload of any of the systems in service with Pakistan. It is probable that Pakistan will be able to eventually minaturize the warhead to fit onto their existing missiles.

The indigenous Pakistani missile program has not made much apparent progress for some time and it is uncertain as to whether research still continues. Reports of a 600

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[75] *Indian Express: 1 February 1997*

[76] P.Sawhney, 'Standing Alone', p.27

[77] Spector Nuclear Ambitions, p.99

[78] Sawhney 'Standing Alone', p.27

km range missile - the 'Hatf-3' - being under development have not been confirmed by any reliable n sources. There have also been some sporadic reports of Chinese M-9 missiles having been delivered.

The reported characteristics of Pakistan's missiles are as follows:

| Type | Range | Payload | Comments |
|---|---|---|---|
| Hatf-1 | 80 km | 500 kg | in service |
| Hatf-2 | 300km | 500kg | status unknown |
| M-11 | 290km | 500kg | 30-60 delivered |
| Hatf-3 | 600km | 500kg | development |

Source: J.Hackett Ballistic Missile Threat : India & Pakistan
CDISS website - www.cdiss.org:80/column3.htm

It is most interesting to note that the range and payload statistics of the M-11 fall just short of those bound by the MTCR ( 300km and 500 kg ). Indian analysts point out that the M-11's range can be easily be extended by reducing its payload.[79]

Pakistan's missile program is neither as extensive nor as sophisticated as India's. With no space program to draw upon, the missile program has had to operate alone. With considerable Chinese assistance Pakistan has acquired a number of ballistic missiles and manufacturing technology. There remains, however, some doubt as to whether Pakistan can manufacture nuclear warheads small enough for its missiles.

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[79] Mention should be made of the'Ghauri' 1500km range IRBM tested on 6 April 1998. Much controversy surrounds this ( including doubts about its range and whether it is an IRBM at all ), but one thing is clear, it is sometime away from operational status and as such has not been discussed.

## Delivery Systems : Part 2 - Aircraft

As in the case of its much larger counterpart, the Indian Air Force, Pakistan's Air Force operates a large number of nuclear capable strike aircraft. and, it is even more likely that Pakistan's primary nuclear weapons delivery system will be aircraft rather than missiles. Pakistan's aircraft, like India's are a mix of some extremely sophisticated types and a larger number of older types, the cutting edge being composed of American supplied F-16s. Forty of these extremely potent aircraft have been delivered to Pakistan and about thirty-four remain in service.[80] There were some problems with spares - due to an embargo from the United States, and plans for further acquisitions have had to be shelved.

As impressive as these aircraft are, the Pakistani Air Force faces a major dilemma when considering them for the nuclear strike role. The F-16A/B is not only Pakistan's most potent strike aircraft, but also the PAFs only truly effective all-weather interceptor. In fact, of the three squadrons currently equipped with the type, all have air superiority as their primary role.[81] This means that the nuclear strike role may have to be relegated to some of the older types in the Pakistani Air Force.

Pakistan operates over 70 Mirage III and 70 Mirage V aircraft.[82] These have been augmented by ex-Spanish aircraft which are to be used for spares. These aircraft are old 1960s vintage types, but are still viable combat aircraft and may have had their older

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[80] International Institute for Strategic Studies, The Military Balance - 1996-1997, p.166 ( London: Oxford University Press, 1996 )

[81] Singh, Rikhye, Steinemann, Fiza'Ya, pp.133-134 The squadrons equipped with F-16s are Nos. 9, 11 & 14

[82] Donald & Lake, Encyclopedia of World Military Aircraft: Volume 1, p.126 & p.129

avionics upgraded. The Pakistani Air Force is apparently quite satisfied with these aircraft and intends to keep them in service for some time. Alternatively, this could simply reflect the fact that Pakistan has so far been unable to obtain more advanced aircraft in spite of prolonged negotiations for Mirage 2000-5s from France.

The bulk of Pakistan's tactical attack force is made up of three squadrons of Nanchang A-5 attack aircraft.[83] These form the 36 Tactical Attack Wing, and are dedicated to the ground support of the Pakistani army. These aircraft could theoretically be used for the delivery of nuclear weapons, but they lack any advanced avionics and possess only an extremely basic countermeasures suite. They are unlikely to be able to penetrate the Indian air defence network and as such cannot be Pakistan's first choice for the delivery of nuclear weapons.

The bulk of the Pakistan Air Force consists of a large number of Chinese F-7s and F-6s - clones of the MiG-21 & MiG-19 respectively.[84] The F-7s are being upgraded with a new radar, but these two types possess a very short range and are not equipped with modern countermeasures. These aircraft are unlikely to be committed to the strike role. These aircraft will be fully occupied in the air defence role in any future Indo-Pakistan conflict. While a few might be spared for occasional strike missions, the bulk of the attack sorties will probably be flown by older aircraft types. Nonetheless, it is possible that Pakistan might reserve F-16s for special strike roles and this may include nuclear weapons delivery. As such it is necessary to consider the F-16 alongside the

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[83] Donald & Lake, Encyclopedia of World Military Aircraft: Volume 2,p.331

[84] IISS, Military Balance - 1996-97, p.166

Nanchang A-5 and the Mirage III/V family when discussing Pakistani attack aircraft.

The characteristics and inventory of Pakistani attack aircraft may be summarized below:

| Aircraft Type | Number | Payload - Total | Combat Radius |
|---|---|---|---|
| F-16A/B | 34 | 7575 kg | 547 km<br>- hi-lo-hi attack profile<br>- 3000 kg bombs |
| Mirage III/V | 140 | 4000 kg | 685 km<br>- lo-lo-lo attack profile<br>- 800 kg bombs + 3 drop tanks |
| Nanchang A-5 | 60 - approx. | 1000 kg | 400 km<br>- lo-lo-lo attack profile<br>- 1000 kg bombs |
| **Total Number of Aircraft** | **250 - approx** | | |

Source: Compiled from details in D.Donald & J.Lake, Encyclopedia of World Military Aircraft - Volume 1 & 2

The figures given for the payload of the aircraft include, not only bombs but also external fuel tanks as well as self-defence air-to-air missiles. Both the F-16s & Mirages possess fire-control radars, but these are not optimised for nuclear weapons delivery.

## Conclusions - Pakistan's Nuclear Capability & Delivery Systems

Pakistan possesses the ability to manufacture atomic weapons and has a working design. Pakistan's missile capability is limited, but is growing - with Chinese assistance.

Pakistan's Air Force possesses a number of strike aircraft, but will have to divert F-16s from their primary air defence role or rely on older, but still effective, Mirage III/Vs. As Pakistan's missile capability grows, greater emphasis will be placed on ballistic missiles as a means of nuclear weapons delivery.

## The shape of future arsenals & possible command structures

Having looked at the basic capabilities of both India and Pakistan, what could future arsenals look like ? Moreover, are there, and will there be secure command structures in place to enable nuclear weapons to be operated with a reasonable degree of safety from an accidental launch ?

In India there is a great deal of speculation about the structure of an Indian arsenal could and should look like. As may be expected there are as many different views as there are analysts,but two main schools of thought can be distinguished - the maximalist and the minimalist.

The maximalist school of thought is best represented by Brigadier V.K. Nair whose views are outlined in his 1992 book Nuclear India. In this book, Brigadier Nair outlines a future Indian nuclear arsenal comprising 132 warheads and including submarine launched ballistic missiles and land based IRBMs. Some other analysts have further argued that India should not stop at IRBMs, but should go further and develop an 'all-horizons' deterrent including ICBMs. The minimalist approach is itself divided into two main schools of thought. Some advocate a non-weaponized deterrent, believing that this is the status quo, while others advocate the overt deployment of a small number of warheads and delivery systems which can be easily developed and deployed at a relatively low cost. India seems to be moving towards a combination of all these schools.

Brigadier Nair calls for the deployment of 132 warheads - to be used against 17 targets in Pakistan and 8 targets in China. He also allows for a 65% reserve for

reliability and a 20% post-war reserve.[84] His proposed delivery systems include five ballistic missile submarines, with sixteen missiles each, and thirty-six land-based missiles, both SRBMs and IRBMs.[85] It will be noted that he does not propose the deployment of ICBMs. This is in contrast to the views of some advocates of the all-horizons capability.

The non-weaponized approach is easily the most popular among academics in India and among many 'India-experts' in the west. This means that India would have all the components in place for nuclear weapons, but not actually assemble them and keep them away from delivery systems.[86] This is supposedly different from the status quo because it would be overt and verifiable by inspection. The theory is that a certain level of deterrence can be reached providing India and Pakistan arrive at some kind of understanding with regards to capped but live weapons capabilities.[87] The problem here is that this is not going to provide much by way of deterrence versus China.

The second body of opinion in the minimalist school advocates the deployment of a small number of warheads and delivery systems. The most articulate advocate of this point of view is K.Subrahmanyam, who suggests that a small force of about sixty 125 kiloton warheads be deployed, split evenly between manned aircraft, IRBMs and

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[84] V.K.Nair, Nuclear India (New Delhi: Lancer Publications, 1992),p.181

[85] ibid pp.170-172

[86] V.Sahni, 'Going Nuclear' pp.91-92 in D.Cortright & A.Mattoo, India and the Bomb: Public Opinion and Nuclear Options ( Notre Dame: University of Notre Dame Press, 1996 )

[87] ibid p.92 This is the view held by George Perkovich - refered to in the introduction - and is an extension of the 'existential deterrence' theory proposed by McGeorge Bundy.

SRBMs.[88] These would be earmarked for use solely against cities and soft area targets and would be used as a second strike option.

India is making no overt moves - as yet - to declare itself a nuclear power, and there have been no overt moves to marry warheads to delivery systems. At the same time, working designs and the production capacity for weapons ranging in yield from 15-20 kiltons to several hundred kilotons have been established. Moreover, India has taken its IRBM and SRBM capability to the production stage, since 'Agni' can be deployed without further testing, and has done considerable work on ICBMs to the point that an Indian ICBM could be developed and deployed with virtually no warning. In addition, India has plutonium stockpiles sufficient for an arsenal of perhaps more than two hundred weapons ( if some material from power reactors is used ). This means that India can deploy an arsenal in size and yield to those envisaged by Nair and Subrahmanyam.

Thus India has a nuclear weapons and delivery capability that permits it to develop and deploy, very rapidly, an arsenal comprising 150 warheads of various yields with delivery being carried out by manned aircraft, 'Prithvi' SRBMs and 'Agni' IRBMs. Moreover, with very little notice, India could move to an 'all-horizons' position with the development and deployment of a limited number of ICBMs based on its PSLV rocket.[89] Perhaps the most interesting part is that India may be able to develop and

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[88] K.Subrahmanyam,'Nuclear Force Design and Minimum Deterrence Strategy for India' in B.Karnad ed. Future Imperilled: Indian Security in the 1990s and Beyond ( New Delhi: Viking, 1994 ),pp.176-195

[89] The only thing missing is the submarine launched ballistic missile capability proposed by Brigadier Nair. This, it would appear, is far too costly for India and is virtually impossible to conceal. India can hide mobile IRBM and ICBMs in forests and in tunnels, but it would be impossible

deploy these systems without actually crossing the rubicon and declaring itself a nuclear power.

In stark contrast, there is little clear indication of what Pakistan's nuclear ambitions are. Unlike India, there is no wide-ranging debate on how many warheads should be deployed, or on how many delivery systems should be procured. Nonetheless, some reasonably accurate assessments can be made about what Pakistan's nuclear arsenal would consist of in the near future.

Based on what was discussed in the previous chapters, it is clear Pakistan will, in the near future, be able to deploy around 30 basic fission weapons based on its limited indigenous production base. While Pakistan may well be able to manufacture a few more, estimates on just how many more would be extremely unreliable.[90] As far as delivery systems are concerned, Pakistan, like India, has nuclear capable strike aircraft and some ballistic missile capability. Pakistan may, in the not so distant future, be able to deploy nuclear armed SRBMs and perhaps IRBMs.

One of the key questions relating to the possibility of a nuclear armed India is that of how secure and reliable is its nuclear command structure. There is little reliable information as to whether or not there is a nuclear command structure at all. However, there is a clearly defined military command structure and there is an established civilian hierarchy, both of which will serve adequately should a retaliatory strike be needed.

Under the Indian Constitution, the highest political authority is the Prime

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to conceal the vast bulk of a ballistic missile submarine.

[90] Similarly, how much of the plutonium from India's commercial reactors has been diverted for weapons use is a matter for speculation and estimates are prone to be unreliable.

Minister while the Supreme Commander of the armed forces is the President.[91] Therefore, it would be expected that the National Command Authority ( NCA ) would be headed by the Prime Minister with the exisiting Cabinet Committee on Political Affairs ( CCPA ) as an aide to the decision making process.[92]

Much will depend on whether India adopts a Launch on Warning or Launch Through Attack policy. General Sundarji argues convincingly that India should adopt the latter since the former is very prone to accidental launches.[93] Having adopted this policy, a less complicated and intricate command structure may well prove adequate. What is needed is a clear chain of command. General Sundarji believes that the first stage would be the establishment of an interim NCA and specifying both the political and military chains of command.[94] This is not particularly difficult for India to do.

As regards command, control, communications and intelligence ( C3I ), no clear picture emerges of just how advanced India is in this area. India is, as discussed earlier, establishing a secure C3I system for its army under project AREN and the air force and navy have similar programmes in place. However, there is no indication of a secure command structure being developed for the political authority.

It has often been argued, by scholars like Neil Joeck, that the Indian military has

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[91] Nair, Nuclear India, p.119

[92] loc.cit.

[93] Sundarji, Blind Men of Hindoostan, p.74. It is also important to realise that the close proximity of India and Pakistan leads to a very short verification time. In addition, the Launch Through Attack policy also ties in with India's decision to make both the 'Agni'( if produced ) and 'Prithvi' systems mobile.

[94] ibid pp.88-89

been entirely kept out of nuclear planning.[95] This is not so. During the Narasimha Rao government, a nuclear planning group was constituted that included the Chief of the Air Staff.[96] The Air Chief at the time was Air Chief Marshal S.K.Kaul who was also Chairman of the Chiefs of Staff Committee, and as the Army and Navy Chiefs rotate through the Chairman's position, they would also be part of the nuclear planning group. More evidence of military involvement in nuclear planning comes from the fact that Air Headquarters is examining the possibility of a Strategic Air Command to control all strategic assets, including long range strike aircraft and surface-to-surface missiles. The intention is to bring missiles earmarked for the nuclear strike role under the control of the Chiefs of Staff Committee.[97] This has already been done for the army's 'Prithvi' missiles which are under the control of Army Headquarters.[98]

So where does this leave the reliability of India's C3I structure ? If India adheres to solely a second strike policy, in other words a no-first use policy, then the existing system, as rudimentary as it is, should prove more or less adequate. The existing military chain of command could be relatively easily given the authority to order a retaliatory strike and a list of targets could be drawn up at fairly short notice. According to Dr. V.Arunachalam, should Delhi be destroyed, a theatre commander would go to a safe and follow the instructions given for nuclear retaliation contained therein.[99] Neil

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[95] N.Joeck, 'Maintaining Nuclear Stability in South Asia': Adelphi Paper 312 ( London: IISS, 1997 ), p.53

[96] Sawhney,To Test or Not to Test, p.32

[97] loc.cit

[98] Obtained in discussions with Mr.'C' in April 1998

[99] Joeck, 'Maintaining Nuclear Stability in South Asia',p.62

Joeck contends that this leads to questions regarding the security of this arrangement and the necessity to validate orders in the absence of a national commander.[100]Such concerns would be even more valid if India were to move to a first-strike posture. Should India need to retaliate, however, the theatre commander would have the authority to follow the retaliatory orders without question.

However, if India should consider a first-strike policy, its C3I structure would prove to be woefully inadequate. This is also true if India seeks to build a formal deterrent against China. There is a much greater chance of an accidental or poorly advised launch than in the case of the five declared nuclear powers. Should India move towards an arsenal including IRBMs and ICBMs, as advocated by the maximalists, there would need to be substantial investments in C3I facilties. As of now India does not seem to be doing this. Until this happens, any move by India to overtly deploy IRBMs or ICBMs would be viewed with great consternation by India's neighbours as much for the physical threat to them as for fears about the inadequacy of the Indian command structure. China would be very wary if the current *ad hoc* system that seems to exist for a nuclear strike against Pakistan continues with IRBMs targetted against Beijing.

There is one thing to consider: India could put in place the necessary C3I requirements without attracting much attention. It is conceivable that India could have already begun work on a thorough nuclear command structure.

In stark contrast to the chronic shortage of information on India's nuclear command structure, some interesting and apparently reliable reports have emerged

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[100] loc.cit.

regarding the Pakistani nuclear command structure. This is an interesting reversal from the considerable quantity information available on India's nuclear potential and the lack of such information regarding Pakistan.

Pakistan is a state dominated by the army, ( not the armed forces, but the army). It is therefore of no real surprise that the most recent and reliable reports give the army control of the nuclear program and, presumably, any existing nuclear arsenal. According to Dr. Ayesha Siddiqa-Agha, the nuclear decision-making system is headed by the army in consultation with the nuclear bureaucracy and the Corps Commanders Conference.[101] The President and Prime Minister are very much secondary figures in this structure, with the unelected President until recently having a higher status than the Prime Minister.[102]

As in the case of India, little is known about the status of Pakistan's C3I facilities. Pakistan has no communications satelites and the overall level of communications technology is highly variable. Like India, many Pakistani military installations are buried underground, but again there is no sign that a secure underground command post for the political establishment exists.

The dominance of the Pakistani army in the command structure must be a cause of some concern. The Pakistani army has traditionally been the most aggressive element

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[101] Dr.A.Siddiqa-Agha,'Ad hocracy, decision-making and Pakistan's arms production and nuclear projects',*Indian Defence Review: July-Sept.1996,* pp.26-27

[102] It is important to explain here that recently, the Nawaz Sharif administration has been able to regain control of the Presidency by the installation of a pliable figure into that office. Up until the death of General Zia-ul-Haq, the office of the Pakistani President and the Army Command were identical.

in the Pakistani political structure and as a result India views this as extremely disturbing. There is a risk that the Pakistani military could initiate a nuclear strike without any restraint from the civilian authorities and without the support of the elected government.

The same questions that are raised about the reliability of the Indian command structure are echoed when looking at the Pakistani command structure. So long as a second-strike policy is adhered to, this command structure could function quite adequately and without too much of a risk of an accidental launch. However, should Pakistan move towards a first-use policy, then the concerns of the Indian government will grow.

One of the major problems facing India and Pakistan is the fact that they are not declared nuclear powers. They are therefore very reluctant to develop a command structure that could give an indication of a possible nuclear arsenal. This is part of the unhealthy air of secrecy over every aspect of the nuclear debate, but is far more serious since it determines the very stability of the nuclear equation in South Asia.

Since neither side admits to having nuclear weapons or to having a nuclear command structure, both countries continue to be highly suspicious of each other and to have no proper dialogue regarding the risks of accidental nuclear war. Moreover, the air of mistrust that exists ensures that confidence building measures will sound like hollow promises to many in both India and Pakistan. This is a major flaw in the arguments of those who advocate a continuation of the status quo.

## *Chapter Four:* The Nuclear Battlefield - India vs Pakistan

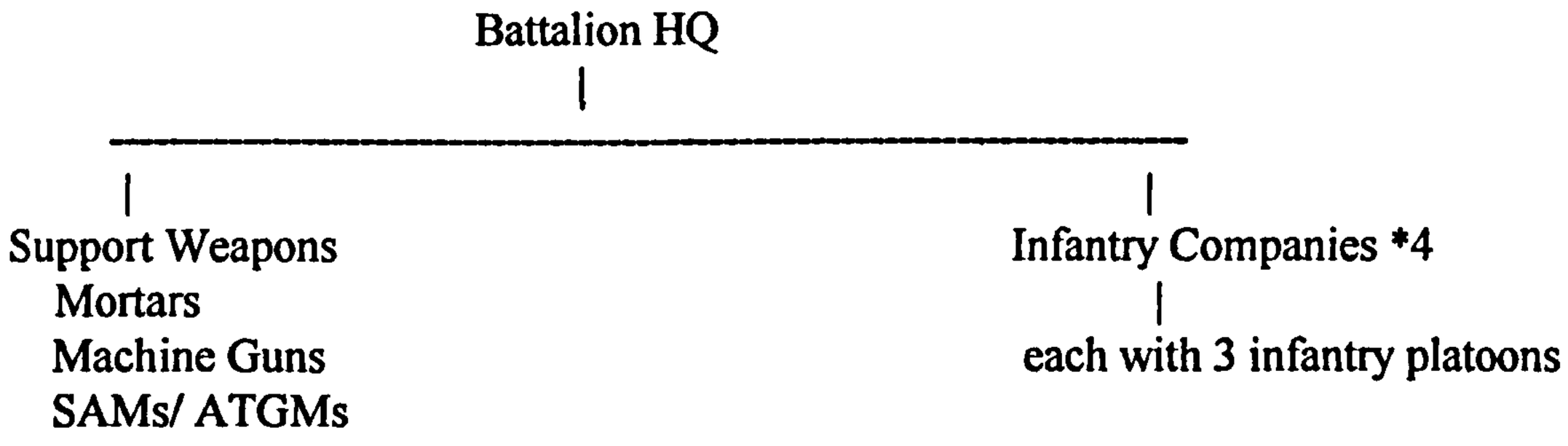
India and Pakistan face each other on some of the most varied and inhospitable battlefields in the world. Both armies have undergone major modernization and reorganization programmes and have sought to bring their military establishments up to much higher technological and tactical standards.The Indian and Pakistani armed forces are two extremely competent military establishments and should not be underestimated.

This chapter will examine nuclear weapons in the context of their possible use on the India-Pakistan battlefield. It outlines the structure and the organizations of the principal fighting formations of the Indian and Pakistani armies will be given, including a reasonably detailed account of the ongoing modernization/re-structuring programme currently being undertaken by the Indian army. In addition, the standard of NBC warfare training will be assessed. This will then be followed by an assessment of the various theatres of possible battle and the overall tactics to be adopted by each side in order to achieve their desired objectives. The advantages and disadvantages of nuclear weapons against available battlefield targets will then be examined. This examination will also explore the chances of successful nuclear strike against a principal offensive formation of either army. Few publications in either India or Pakistan discuss the battlefield impact of nuclear weapons. This is not surprising and is in keeping with the policy of nuclear ambiguity that currently holds sway over the political and military elites of both countries. A discussion of this aspect of the India-Pakistan nuclear equation must be carried out as it may determine nuclear strategy against civilian targets.

## The Indian & Pakistani Armies: - Organization & Structure

Some of the basic formations that exist in both armies are virtually identical in India and Pakistan, indeed in most Western influenced armies, and as such some generalizations can be made. The basic infantry fighting formation is the battalion. It is composed of four rifle companies and headquarters and support companies. Its heaviest weapons are generally mortars and machine guns, though some may also have anti-tank and surface-to-air missiles.[1] In addition to basic infantry battalions, mechanized, parachute and commando battalions also exist, each created, trained and equipped for a special role.[2]

An average infantry battalion has the following structure:[3]




Artillery and armoured formations have battalion equivalents called regiments. These are organized in a similar manner - armoured regiments have four tank squadrons

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[1] IDR Research Team, 'Some thoughts on the Evolution of Infantry Organization and Tactics' , Lt. Gen. M. Thomas ed.*Indian Defence Review: July 1991*,p.52-53

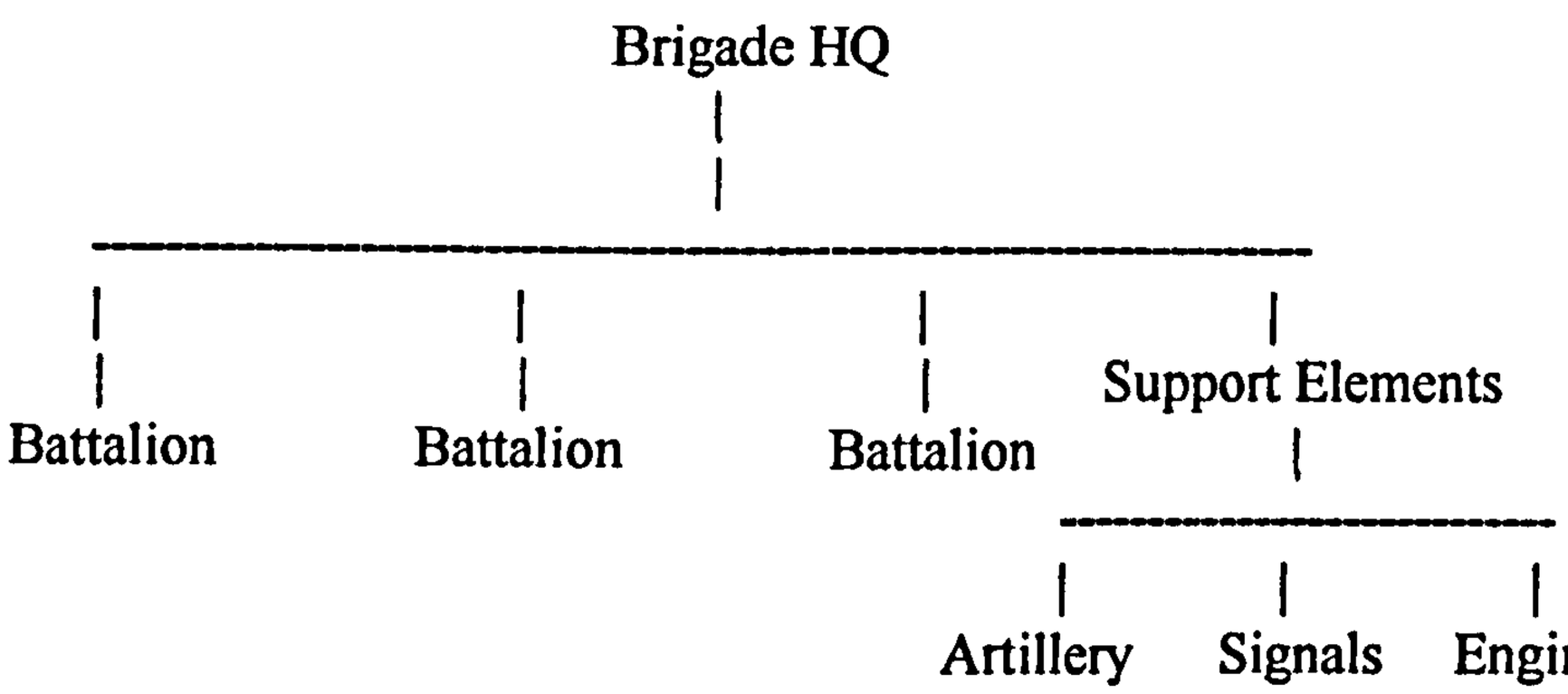
[2] Maj.Gen.A.Karim ed., The Indian Armed Forces - A Basic Guide,( New Delhi: Lancer Publ.,1995 ), pp.30-31

[3] Loc.cit

while artillery regiments have between three and four artillery batteries.[4] All of these formations are of similar size, about one thousand men. Battalion sized formations are amalgamated with other formations to form brigades.

In the India-Pakistan context, the most important formation is the brigade. Like the battalion, there are armour and artillery equivalents, but all share a basic similarity of structure. A brigade consists of three battalions or regiments and is usually provided with some supporting equipment - artillery and heavy mortars in the case of armour and infantry units. Some brigades, however, are designed to operate independently and these are given more supporting elements, including engineering and signals as well as additional artillery.[5]

A typical brigade would have the following structure, whether operating as part of a division or independently:




Brigades are usually grouped together, with additional artillery, engineering,

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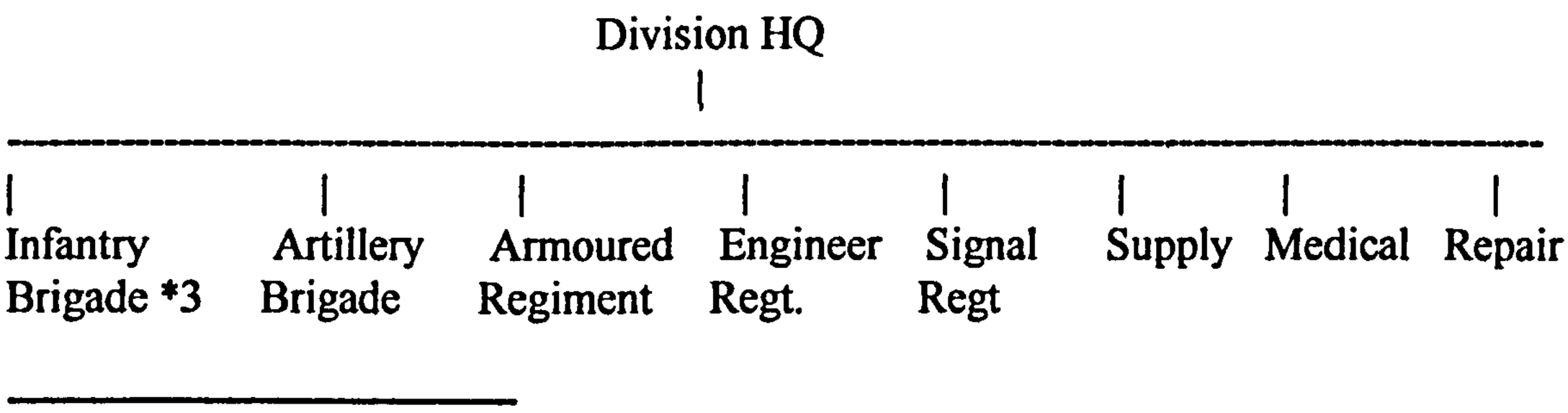
[4] ibid pp. 36-41

[5] ibid p. 26

signals and other support elements to form a division. India and Pakistan operate two basic types of division: infantry and armoured.[6] India's infantry divisions are divided into plains and mountains formations which, as their names suggest are trained and equipped to fight in different geographic environments. The mountain divisions are primarily earmarked for use against China, though they could be converted for use on the plains after reequipment.[7]

A typical infantry division comprises three infantry brigades, an artillery brigade and an armoured regiment[8]. Support elements include an engineer regiment, a signal regiment and an air observation post flight, in addition to medical, transport, supply and repair units.[9] Mountain divisions lack the armoured regiment and tend to have smaller calibre artillery. They also have more engineering and support/logistics elements than plains formations.[10]




[6] India attempted to create a mechanized division in the late 1980s. However, no effective use could be found for such a formation and it was converted into an armoured division.
A recent development in both armies is the creation of a specialist Artillery Division comprising three independent artillery brigades.

[7] Karim, Indian Armed Forces, p.25

[8] IDR Research Team, ' Some thoughts on the Evolution of Infantry Organization and Tactics ', p.53

[9] Lt.Gen.M.Thomas, 'The RAPID: An appraisal of India's new look infantry division for warfare in the plains ', *Indian Defence Review: January 1989*, p.92

[10] IDR Research Team, 'Some thoughts on Evolution of Infantry Organization and Tactics', pp.53-54

This represents the typical organization of a plains infantry formation[11].

The largest formation of any army is the corps. This formation, pioneered by Napoleon, consists of three divisions and their supporting arms. In the South-Asia context, there are two types of corps: Holding Corps and Strike Corps. The former are designed for defensive operations while the latter is the principal offensive formation of both armies.

## The Indian Army: Order of Battle

The Indian army consists of 11 Corps sized formation with a total of 36 divisions and a number of independent brigades. The cutting edge of the Indian army is centred around three powerful Strike Corps - each built around one armoured division. The other eight Corps are defined as Holding Corps, though they may have significant offensive potential. There may be some minor changes to the ORBAT, but no significant changes are expected in the foreseeable future. There are some differences between the ORBAT outlined below and that listed in many published sources, but this ORBAT is more representative of the current Indian army than other sources. The Indian Army Order of Battle is outlined below:[12]

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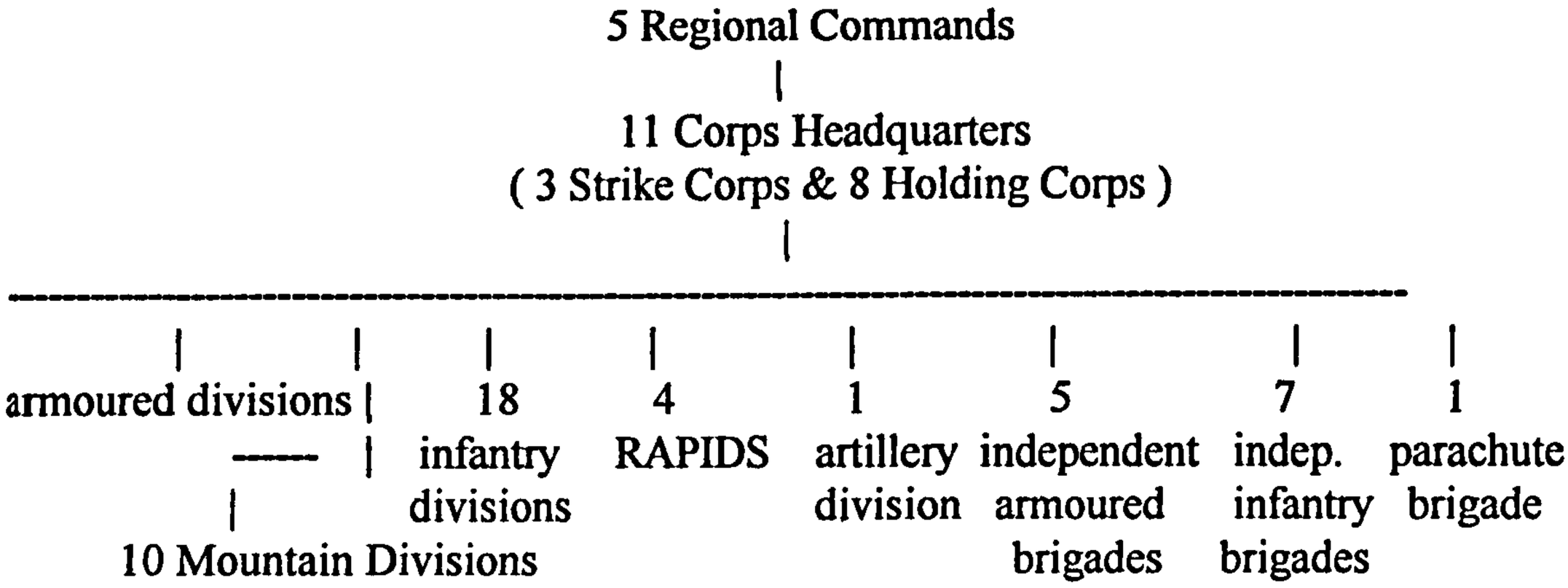
[11] Karim, Indian Armed Forces, p.26

[12] ORBAT taken from *Asian Age*: 12-13 November 1994. This differs significantly from the ORBAT given in the IISS Military Balance, but is far more accurate. The article was written by Pravin Sawhney. The author discussed this ORBAT with both Sawhney and other Indian officers, it was generally agreed that the ORBAT listed below was reasonably accurate.




In addition to these combat formations, the Indian army has four engineer brigades and 14 Army Aviation Corps Helicopter Units.[13] A separate Corps of Air Defence Artillery operates six air defence brigades and two surface-to-air missile groups.[14] These elements are assigned to formations on a need basis, though, with CADA units in particular, many are earmarked for deployment and operations with specific formations.

As mentioned before, the principal offensive formations of the Indian army are the three Strike Corps - 1 Corps, 2 Corps & 21 Corps.[15] These are built around a nucleus of a single armoured division and two infantry divisions - probably with more

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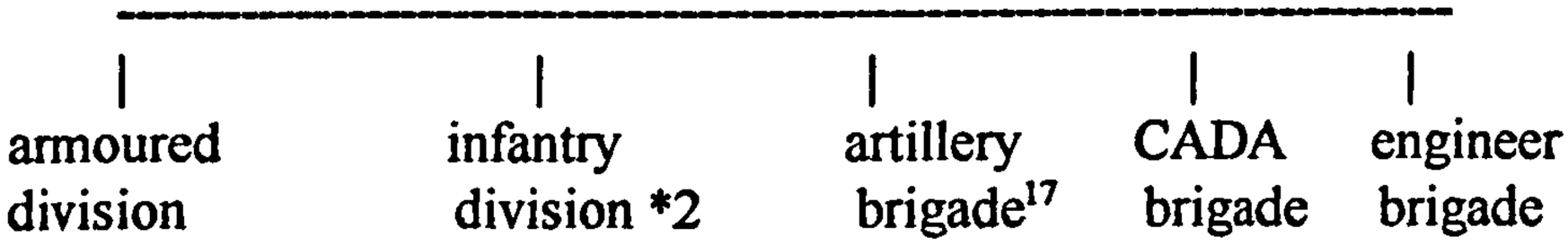
[13] loc.cit. The Army Aviation Corps operates a mix of light utility helicopters, some of which are armed with anti-tank missiles. Proposals to transfer the IAF helicopter gunship squadrons to the AAC failed to produce any result.

[14] CADA is responsible for army air defence and has a wide range of guns and missiles at their disposal. CADA is in the process of a massive re-equipment and modernization programme which will dramatically enhance its capability. This will have a major impact on the ability of enemy aircraft to damage key army formations and will be dealt with in more detail later in this chapter.

[15] 21 Corps is built around 33 Armoured Division. This was formerly 33 Mechanized Division, but the Indian army failed to find a use for such a formation and as such decided to convert it into a full-fledged armoured division.

mechanized brigades than basic infantry formations. The typical Strike Corps has the following structure:[16]




The Holding Corps are not as well supplied with support, from either CADA or the engineers as the Strike Corps, and do not possess armoured formations larger than brigades and the armoured regiments attached to the infantry regiments. These formations have significant offensive capability, but are largely designed to operate in a defensive role.

The Indian army possesses a fairly varied arsenal of reasonably advanced weapons. Each combat arm - armour, artillery and infantry is in the process of a massive modernization program which was slowed in the early 1990s thanks to budgetary constraints. However, the program has resumed and has started to show some results, many of which will have a significant impact on the ability of the army to operate in a hostile nuclear environment. The pace, if monitored on a year by year basis, may seem slow, but in reality the Indian army is working to a well conceived plan.

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[16] *Asian Age:* 12-13 November 1994

[17] This is in addition to the organic artillery support of the armoured and infantry divisions

Indian Army: Status of Combat Arms:

**Armour:**

Indian armour is divided into three basic formations - the division, the independent brigade and the armoured regiment of the infantry division. These are equipped with three basic types of tanks - the T-72M1, modified T-55s and Vijayantas.

The Indian army intends to have 65 regiments of armour by the year 2000, each with between 55 and 72 tanks.[18] The T-72M1 is now the principal combat tank of the army and has replaced the Vijayanta in local production. The new Arjun Main Battle Tank is entering service at an extremely slow rate. As of now, 62 regiments exist, with a total of over 3,500 tanks:[19]

35 regiments T-72M1 - over 1900 in service

13 regiments T-55 - over 700 in service - 200 in store

14 regiments Vijayanta - over 1000 in service - 1000 in store

The current Indian fleet of T-72M1s are in the process of a major upgrade program which has focussed on the provision of thermal sights, additional armour, better ammunition and better fire protection.[20] The older tanks have already undergone

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[18] P.Sawhney, 'Indian Battletanks: How far will they go ?', *The Asian Age*: 11 August 1994,p.13
This regiment combat unit is called a 'brick. Much commotion resulted when T-72 units were formed with a brick of 45 tanks - with 10 more in reserve - compared to the 72 tanks in a Vijayanta brick.

[19] These figures differ significantly from those in the IISS Military Balance but are more accurate and are based on discussions with Mr.'C' in April/May 1996

[20] Govt. of India, Ministry of Defence Annual Report: 1995-1996, p.56
These upgrades would solve many, if not all, of the weaknesses of the basic T-72 that were so glaring during the 1991 war against Iraq.

minor upgrades - night-fighting in both T-55s & Vijayantas and replacement of the original 100mm guns on the T-55 with 105mm guns. Some of the Vijayantas have been given additional applique armour.[21]

**Artillery:**

India's Regiment of Artillery has recently undergone a reorganization programme which has resulted in the field branch of artillery being separated from the Corps of Air Defence Artillery and the Army Aviation Corps. It now possesses close to 200 regiments with approximately 4000 pieces of artillery of various types.[22]

The vast bulk of India's artillery is towed - rather surprising considering the increased mechanization of the Indian army. The 130mm Catapult and 105mm Abbot self-propelled guns are now being phased out of active service due to age and mechanical problems.[23] The massive competition for 155mm SP guns has been given a lower priority and consideration has been given to obtaining several regiments of 152mm SP guns of Russian origin.[24]

The Artillery Plan 2000 seems to give much priority to the acquisition of large

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[21] loc.cit. The number of upgrade programs is taking money needed for the induction of the Arjun battle tank
See also: IDR Research Team, 'Armour Update', *Indian Defence Review: January 1990*,pp.176-178

[22] P.Sawhney, 'India's Artillery is a force in its own right', *Jane's Defence Weekly: 9 October 1996*,p.35

[23] ibid pp.35-36

[24] P.Sawhney, 'US for Technology, Russia for Spares', *The Asian Age*: 26 January 1995,p.13
There have been persistent rumours that 120 2S5 152mm guns will be 'gifted' by Russia while negotiations for more advanced 2S19s are in progress.

numbers of SP artillery.[25] As it would be difficult, if not impossible, for towed artillery to operate effectively in a nuclear environment, one wonders if this says anything about India's attitude towards battlefield nuclear warfare. To further complicate the issue, a former Chief of Army Staff has written that the nuclear battlefield places less emphasis on artillery support while the Regiment of Artillery sometimes voices the opposite![26]

According to informed sources, the new Indian military doctrine emphasises attrition warfare over the previous manoeuvre policy. This means that the artillery, which used to be a combat support arm, is now classed as a combat arm with priorities shifting between direct support and counter-bombardment.[27] The new army tactical doctrine will be discussed in detail later in this chapter, however, the basic thrust has moved from deep thrusts with mechanized forces to maximum attrition of enemy forces, limited manoeuvre and attacks on strategic and operational targets.[28] Artillery, therefore, has a central role to play in any attrition based doctrine.

The real modernization of Indian artillery is in the development of Surveillance and Target Acquisition (SATA) batteries. These are being supplied with indigenously manufactured battlefield surveillance radar as well as artillery locating radars.[29] This

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[25] The emphasis is on the acquisition of more 130mm M-46 field guns and the conversion of several 105mm regiments to 130mm while others are slated for conversion to 155mm - rebarrelled 130mms. The Prithvi SSM comes under the regiment of artillery and is described in another chapter. The artillery is also inducting a potent new multiple rocket launcher - the Pinaka.

[26] K.V.Krishna Rao, Prepare or Perish ( New Delhi: Lancer International, 1991 ), p.404

[27] Sawhney, 'India's Artillery is a force in its own right', p.35

[28] Loc.cit.

[29] Ministry of Defence, Growth and Achievements of DRDO in last 10 years, p.26 The 'Rajendra' radar used by the Akash SAM can be used in the artillery locating role. The Stentor Battlefield Surveillance Radar is

dramatically enhances the effectiveness of Indian artillery. A number of Israeli made Remote Piloted Vehicles are being obtained for the targeting of the Prithvi SSM.[30]

The changes being made in Indian artillery give some indication of Indian army tactical thinking. They also give some clues about India's new military doctrine. The problem is that, to the outside observer, there seem to be many contradictions in what has been publicly been revealed about this military doctrine, especially regarding the artillery.

**Infantry:**

The Indian infantry has, since the 1980s, felt itself a neglected service. The major re-equipment programs that affected the armoured regiments and, to a lesser extent, the artillery, did not come to the infantry. This is not to say that the Indian infantry has remained unchanged, as it is in fact constantly changing. The infantry's anti-tank, night fighting and target acquisition capabilities have been substantially enhanced, and some expansion of mechanized infantry units was undertaken.

By far the most significant development as far as India's infantry is concerned has been the creation of the RAPID - Reorganized Army Plains Infantry Division. This is a uniquely Indian creation and is specifically designed for the South Asian battlefield. The

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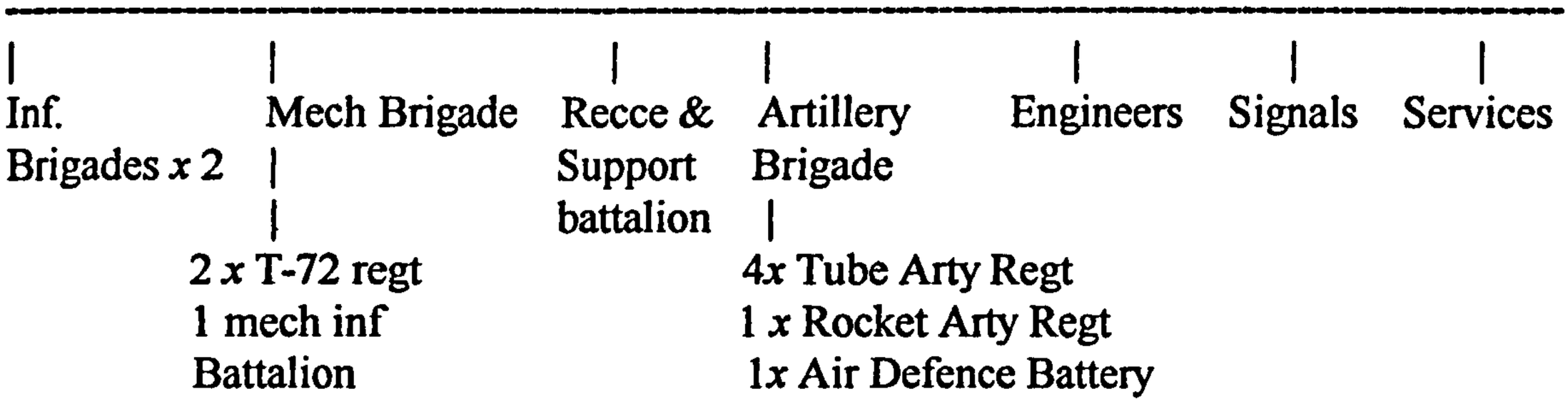
manufactured under license while a number of American made AN/TPQ-37 radars may have been ordered.

[30] The Israeli RPVs have already been purchased. Indian designed RPVs are now entering production to supplement and then supplant the Israeli models. See: *Indian Express*: January 6 1997

basic RAPID has one mechanized infantry and two standard infantry brigades:[31]




There are currently four RAPIDS in the Indian army, these being attached to the Holding Corps in Punjab and Rajasthan.[32] The RAPID provides these essentially defensive formations with an extremely flexible unit that dramatically enhances their ability to withstand offensive operations by Pakistani armour. Moreover, the RAPID possesses sufficient armoured/mechanized infantry assets to conduct reasonably significant offensive operations.[33] The RAPID is also easily adaptable to NBC warfare.

The advent of the RAPID was accompanied by a dramatic upgrade of Indian army C3I assets and communications. Under plan AREN - Army Radio Engineering Network - a secure, real-time network was established, significantly enhancing the

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[31] Thomas, 'The RAPID: An appraisal of India's new-look infantry division for warfare in the plains', p.93

[32] ibid p.101

[33] ibid pp.93-101 This article provides a detailed, yet concise account of how the RAPIDS are likely to be used in both offensive and defensive operations.

army's ability to conduct and manage major offensive and defensive operations.[34] Moreover, because it is EMP ( electromagnetic pulse ) shielded, this network provides the Indian army, for the first time in its history, with a reliable C3I system that could continue functioning in a nuclear environment. This is extremely significant and could be an indication of an emerging Indian battlefield nuclear doctrine.

Indian officers view the infantry as being particularly significant for wars of the future and substantial investments are finally being made in terms of equipment upgrades and enhanced training. The Indian Army has made the acquisition of better anti-tank and personal weapons, communications gear and night-fighting capabilities for its infantry a top priority.[35]

These will satisfy most, if not all, of the foreseeable infantry modernization targets for the next decade.[36] Indian officers have also stressed the need for infantry to be prepared for NBC warfare and have made this something of a priority.[37] Items such as body armour and improved web gear are finally being issued to infantry units.

In order to cope with massed Pakistani armour, the old 106mm recoilless guns issued to infantry anti-tank units are being upgraded as well as supplemented with new

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[34] K.Bajpai, P.Chari, P.Cheema, S.Cohen, S.Ganguly, Brasstacks and Beyond, ( Delhi: Manohar, 1995 ), p.29

[35] P.Sawhney, 'India pushes Self-Reliance Plans', *International Defence Review: November 1996*, p.6

[36] Brigadier O.Kaushik, 'Infantry in the battlefield of AD 2000', *Indian Defence Review: July 1989*,pp.31-32

[37] ibid p.32 See also Ministry of Defence Report 1995-1996, p.14

anti-tank missiles.[38] In addition, night vision equipment - of the imaging intensifying as well as thermal imaging types - are now being more widely issued to infantry units.[39] These items, while relatively minor in themselves, dramatically enhance the fighting potential of the infantry.

One of the more interesting aspects of India's infantry modernization is the lower importance of increasing mechanization. Mechanized infantry units, mounted in BMP-2 infantry combat vehicles are critical components of the Strike Corps and the RAPIDS, however, they have not made their way into the rest of the army in any major way. It is possible that the Indian army may consider the reorganization of some more infantry divisions into RAPIDS, budgetary allocations permitting.[40]

Indian infantry formations have undergone some substantial changes in the last few years. For the first time, however, the infantry has been given priority over the other arms in the acquisition of new equipment. This means that the Indian infantry of the next decade will be better organized, and trained and equipped for any possible scenario.

**Air Defence:**

India's Corps of Air Defence Artillery - CADA - is one of the newest formations

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[38] P.Sawhney, 'India pushes Self-Reliance plans', p.6 The Milan and Konkurs ATGMs are manufactured in India and are now standard issue to infantry battalions. The 106mm guns are retained for use against secondary targets.

[39] The ATGM launchers are fitted with thermal sights while all infantry weapons are fitted with image intensifying sights. These systems are locally made by Bharat Electronics Limited.

[40] Interview with General Shankar Roy Choudary in *Frontline: March 8 1996*, pp. 9-10 The General did not specifically state this but gave the impression that some more infantry formations might be reorganized

in the Indian army. The Indian army possesses one of the largest array of medium and short-range air defence systems of any army in Asia. Moreover, CADA is set for a major expansion and reorganization programme which will significantly enhance its lethality.

At present, CADA has, as its pride of place, two huge missile groups equipped with SA-6 surface-to-air missiles.[41] These are assigned to the Strike Corps and represent a powerful deterrent to any attack aircraft. In addition, there are 30 regiments with Bofors L-40/70 towed anti-aircraft guns, four with ZSU-23/4 self-propelled AA guns and a number with towed ZU-23 guns. These are complemented by a number of mobile point-defence missile regiments with SA-8b and SA-13 missile units.[42]

As part of its modernization programme, CADA's equipment is set for a dramatic upgrade. The Strike Corps may well be provided with a new air defence brigade group - comprising S-300 PMU-1 (SA-10), OSA-AKM (SA-8b) and ZSU-23/4 or Tanguska regiments.[43] India's indigenous SAMs - the Akash & Trishul - are to be deployed as replacements for the SA-6 and SA-8 respectively and will enter service in the next two years. Man-portable SAMs - namely the SA-16 - are used to cover 'blind-areas' for CADA units as well as being on issue to infantry battalions.

Not only will these systems be highly effective against aircraft, but the S-300s and Akash units would provide a very significant defence against ballistic missiles. This

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[41] R.Rikhye, The War that Never Was, ( New Delhi: Chanakya 1988 ), p.61

[42] ibid pp. 60-61 Man-Portable SAMs - SA-7/-16 etc. are issued to provide close protection to SAM groups and enough SA-16s are available to equip every infantry battalion.

[43] Obtained from press reports circulating in January 1997. Some of the equipment is already in place. The Tanguska is a mobile SP air defence system with both missiles and guns. The S-300 PMU-1 deal is under negotiation.

would mean that any aircraft or missile attempting to deliver a nuclear, or any other, warhead onto an Indian military target will have to contend with an extremely sophisticated air defence screen.

This screen would be most dense at corps and division level and would still have a significant impact at brigade level. The only easy targets for Pakistani aircraft or missiles would be Indian infantry battalions which would only have a few SA-16 man-portable SAMs for air defence. Therefore, the question any Pakistani planner would have to ask is whether the benefits of attacking a major Indian combat formation with nuclear weapons are worth the risk - a risk which is getting higher and higher.

The Pakistani Army: Order of Battle

The Pakistani army is organized into nine Corps and Force Command Northern Area. These contain 22 divisions , 15 independent brigades (6 armoured and 9 infantry), 9 Corps artillery brigades, 7 engineering brigades and 15 army aviation squadrons - including two of attack helicopters.[44] In addition, the Pakistani army has 8 air defence brigades. It must be pointed out, however, that Pakistani brigades and divisions are somewhat smaller than their Indian counterparts. Again, this order of battle differs to a certain extent from that normally quoted. The order of battle is as follows:[45]

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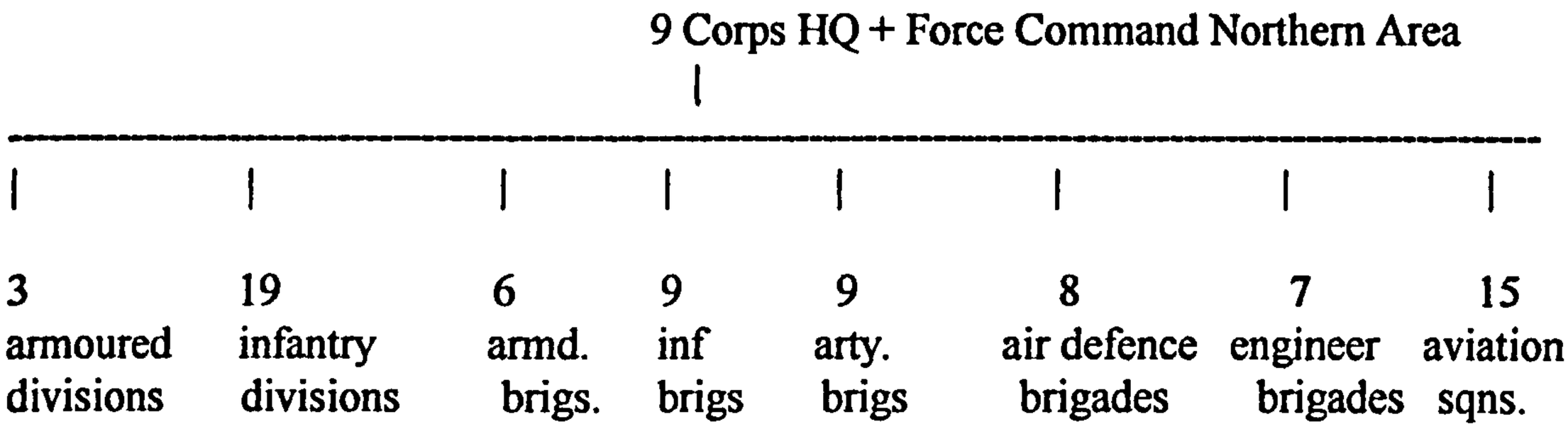
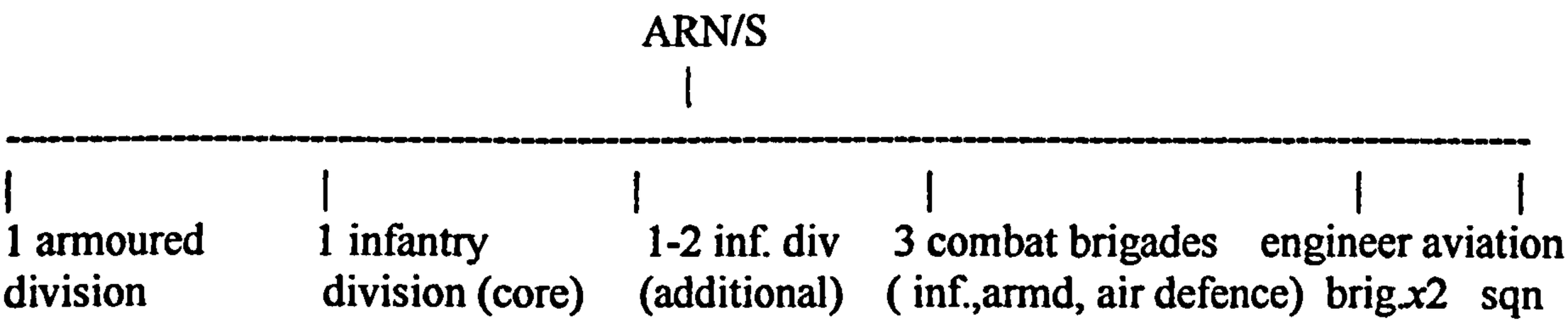
[44] *Asian Age*: 12-13 November 1994 After this article was written, a third armoured division was raised.

[45] loc.cit




Pakistan's two principal fighting formations are Army Reserve North (ARN) and Army Reserve South (ARS). These are an approximate equivalent to the Indian Strike Corps in terms of size and composition. These have, as in the case of their Indian counterparts, a nucleus of a single armoured division and up to two infantry divisions with numerous brigades:[46]




Status of Combat Arms:

**Armour:**

As in the case of the Indian army, the Pakistani army possesses three armoured division and a number of armoured brigades. These operate almost 2,500 Main Battle Tanks of a bewildering variety and from various generations.[47] The most recent

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[46] loc.cit. This article has the most accurate order of battle for both the Indian and Pakistani armies.

[47] IISS, The Military Balance: 1996-1997, ( London: Oxford University Press, 1996 ) p.165

acquisitions are 320 T-80 UD MBTs from the Ukraine.[48] This deal has been mired in controversy because of Russia's refusal to supply spares, including gun barrels, and doubts over Ukraine's ability to provide spares and support.[49]

The T-80UD is a major improvement over the existing Pakistani tank fleet. The most modern units, until the arrival of the T-80UDs, were license made Chinese T-85 II tanks. An indigenous MBT - the Al-Khalid - has failed to materialise.[50] The rest of the fleet consists of over a thousand T-69/-59 tanks of Chinese origin, which have been upgraded with 105mm guns.[51] The rest of the fleet is a mixture of 1950s & 1960s vintage M-47/-48A5 tanks. These, while serviceable, are not really a match for even older Indian armour.[52] The Pakistani tank fleet lacks modern fire control equipment and advanced night-fighting capabilities. It can be expected that Pakistan will attempt to rectify this in the near future.

**Artillery:**

As in the case of its Indian counterpart, Pakistan's Regiment of Artillery has undergone a tremendous re-organization and modernization programme. While substantial quantities of new equipment have been inducted, large numbers of

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[48] 'Ukraine is firm on T-80UD sale' in *Jane's Defence Weekly: 2 April 1997*, p.13

[49] loc.cit.

[50] Jane's Defence '97, p.36

[51] These tanks are based on the Soviet T-55. Unlike their Indian counterparts, the Pakistani tanks have not been subjected to a major modernization of fire control systems and night-vision equipment.

[52] The entire Pakistani tank fleet, with the possible exception of the T-80UDs is extremely vulnerable to Indian anti-tanks weapons - even older types. The M-47/-48A5s fared badly against Indian Centurions in the 1965 & 1971 wars and the Chinese T-59 fleet is not particularly advanced.

completely obsolete artillery pieces - long since relegated to reserve/storage status in the Indian army - remain in service.

Pakistan created the subcontinent's first artillery division using a core component of two artillery brigades and an air defence unit.[53] While Pakistan has far fewer artillery tubes than the massive Indian artillery park, it is interesting to note that it was responsible for this major organizational innovation.[54]

The most noteworthy feature of Pakistan's artillery is the number of 155 and 203mm self-propelled guns.[55] This gives Pakistani armour an integral artillery capability that is currently lacking in Indian armoured units. Moreover, these guns are more easily operated in an NBC environment than towed guns.

Pakistan's artillery also comprises an assortment of older pieces, including some Second World War vintage 25 pounders. As in the case of the Indian artillery, considerable progress has been made in the introduction of fire control computers and other surveillance and target acquisition equipment. This, of course, dramatically enhances the efficacy of artillery - no matter how old the guns are.

**Infantry:**

There is not much difference between Pakistani and Indian army infantry formations. Pakistan has not developed an organization equivalent to the Indian

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[53] Maj. S.Bhaduri, 'Weapons Overview: The Artillery Division', *Indian Defence Review: Jan 1992*, p.114

[54] IISS, Military Balance: 1996-97, p.165. Pakistan's artillery also inducted a limited number of artillery locating radars - or so Indian sources claim ( IISS sources do not list these radars ). Pakistan has fewer than 2,000 artillery pieces in total.

[55] IISS, Military Balance: 1996-97 Over 200 M-109 & M-110 SP artillery pieces are in service.

RAPIDS and has not attempted the massive modernization programme - in terms of modern night vision, target finding and anti-tank weaponry - that the Indian army has recently undertaken.

The only really noteworthy aspect of the Pakistani infantry is the fact that it was the first to introduce mechanized units to the subcontinent. These mechanized infantry units are provided with over eight hundred M-113 armoured personnel carriers.[56] While not as capable as India's BMP-2 units, these older APCs provide Pakistan's infantry with a reasonable degree of battlefield mobility. However, as far as NBC warfare is concerned, these older APCs offer somewhat less protection than the BMPs.

**Air Defence.**

Unlike the Indian army, Pakistan lacks any medium self-propelled surface-to-air missiles and modern self-propelled air-defence guns. Pakistan's six air defence brigades are equipped with a wide variety of shoulder-launched SAMs and thousands of towed air defence guns.[57] These are used with both Western and Chinese fire-control radar.

It is not known if Pakistan intends to obtain any more advanced radar and target acquisition equipment. The Pakistani army air defence units remain constrained in their ability to obtain advanced self-propelled air-defence assets since Russia, the principal producer of these items, will not sell these items to Pakistan. Strangely enough, Pakistan does not seem to be making particularly vigorous efforts to rectify this shortcoming in their army air defences.

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[56] IISS, Military Balance: 1996-97, p.165

[57] loc.cit.

NBC warfare:

Both the Indian and Pakistani armies are extremely well trained. This is especially true up to brigade level. Both armies possess a high degree of tactical skill and pride themselves on their ability to perform their assigned tasks. Using a mixture of traditional methods and modern techniques and equipment, both armies are extremely capable. In the area of NBC warfare, however, a rather confusing picture emerges. Both countries frequently made mention of their ability to fight in NBC conditions, but little hard information is available on the degree of NBC readiness.

In the 1980s, the Indian army began some tentative preparations for NBC warfare.[58] In the early part of that decade, a limited quantity of S6 respirators and No.1Mk.3 NBC suits - both of British origin - was purchased.[59] A quantity of NBC equipment was imported from the USSR, but proved to be useless in Indian environmental conditions.[60] Moreover, India's defence research organization, in 1987, produced prototypes of NBC suits, decontamination suits, facelets, overboots and NBC tents.[61] This equipment has entered production and service with the Indian armed forces.[62]

As regards training, from 1987 onwards, the Indian army, through its College of

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[58] S.Gupta, 'The New Thrust', *India Today*: November 15 1985,p.58

[59] A colour photograph of this equipment appeared in The Indian Army ( New Delhi: Lancer, 1990) which was edited by Lt.General Mathew Thomas.

[60] Personal communication with Mr. 'D' on 28 July 1994

[61] S.P.Baranwal, The Military Yearbook: 1987-1988, ( New Delhi: Guide Publications, 1988 ), p.243

[62] 'Five-fold NBC protective system develope for safety of troops' - UNI report in the *Deccan Herald:* October 18 1997

Military Engineering, began running familiarization courses in NBC warfare,[63] while scientist conducted courses at brigade level.[64] Moreover, a series of studies were undertaken to provide for both active and passive defence against nuclear attack for army combat formations.[65]

As regards equipment, the Indian Ministry of Defence has obviously allocated high priority to the indigenous production of NBC gear.[66] This has also involved the participation of the private sector for the manufacture of both NBC suits and respirators.[67] In addition, the Indian army has retained its old Second World War respirators - these are old, but would still offer significant protection.[68] India would not find it particularly difficult to produce enough NBC personal gear - respirators and NBC suits - for its armed forces in a relatively short period of time - though this equipment might be placed in storage. Mention should also be made of the fact that a new decontamination vehicle has entered production.[69]

While it is abundantly clear that NBC warfare has been accorded a much higher priority in the Indian army, it remains unclear as to the exact status of NBC

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[63] ibid p.311

[64] ibid p.244

[65] 'IDR comment: Internal Affairs', Lt.Gen. M.Thomas ed., *Indian Defence Review: July 1987*,p.18

[66] Ministry of Defence Annual Report: 1995-1996, p.14

[67] The company, Modern Apparels, has submitted such suits to the Indian Navy's evaluation centre.
Private sector involvement has made India self-sufficient in respirator production - while many of these are not really intended for military use, these respirators offer significant NBC protection: communication with Dr.'I': undated letter received on 3 March 1997.

[68] Personal communication with Lt.General 'J' dated 18 August 1994

[69] Ministry of Defence Annual Report: 1995-1996, p.56

preparedness and training in the Indian army. Attempts to contact senior military officers on this subject proved unsuccessful, though some retired officers offered some vague information that leads to the conclusion that some training is in progress.

It has become clear that India's Army Training Command has conducted detailed studies into NBC warfare.[70] Indeed, given India's perception of its nuclear threat, it is not surprising that the Indian army schools of instruction and combat include NBC scenarios.[71] Moreover, the publisher of the prestigious Indian Defence Review stated that the forces earmarked for use against Pakistan are well equipped to deal with NBC warfare.[72]

It would be natural for India's Strike Corps to be the first to be fully equipped and prepared for NBC warfare and there are some indications of this beginning to occur. It is highly probable that at least one Corps is fully prepared - trained and equipped for NBC warfare. The other formations, would probably receive - or already have access to personal NBC gear - but will be allocated a lower priority for receiving decontamination and monitoring equipment. It should be pointed out that the RAPIDS require virtually no modifications for deployment in an NBC environment.[73]

It can probably be assumed that the state of NBC warfare in Pakistan is in a similar state to that of India, except that Pakistan's industry is not yet capable of meeting

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[70] *The Hindu Weekly - International Edition*: 3 December 1994, p.5

[71] Personal communication with Lt.General 'A' dated 13 December 1994

[72] Personal communications with Captain 'B' dated 3 August 1994 and 30 August 1994

[73] Thomas, ' The RAPID: An appraisal of India's new-look infantry division for warfare in the plains ', p.93

all NBC needs and that the country lacks the massive R & D infrastructure of India. Indian sources assume that Pakistan has a nucleus of NBC trained personnel - with Chinese NBC gear.[74]

One thing is clear, however, both countries have now made NBC warfare something of a priority and are making efforts - covertly - to train and equip themselves. Nonetheless, there may be a large gap between what the military wants and reality.

While there is some reference to NBC warfare and the necessity to fight under such conditions in both armies, there have never been any major NBC exercises conducted by either side. It is therefore not inconceivable that the principal focus of NBC training and equipment programs in both countries is more geared towards meeting an emergency that might arise after one side uses such weapons. This would involve stockpiling equipment and drafting rapid training instructions - aimed at rapidly familiarizing troops who have to enter an NBC contaminated area. It does not seem that either country intends to develop a tactical nuclear warfare doctrine.

One of the reasons for the lack of NBC exercises could be the extremely severe environmental conditions prevailing on the South Asian battlefield. These conditions range from the intense cold of the Siachen glacier to the blistering heat of the Thar desert. Under normal peacetime conditions these climates pose great difficulties for human endurance, if the troops were clad in full NBC gear and armoured vehicles 'buttoned-up', there would be more casualties from heat-stroke than from exposure.[75]

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[74] Lt.Gen.M.Thomas, 'Indo-Pakistan Equation' , *Indian Defence Review: January 1987*,p.13

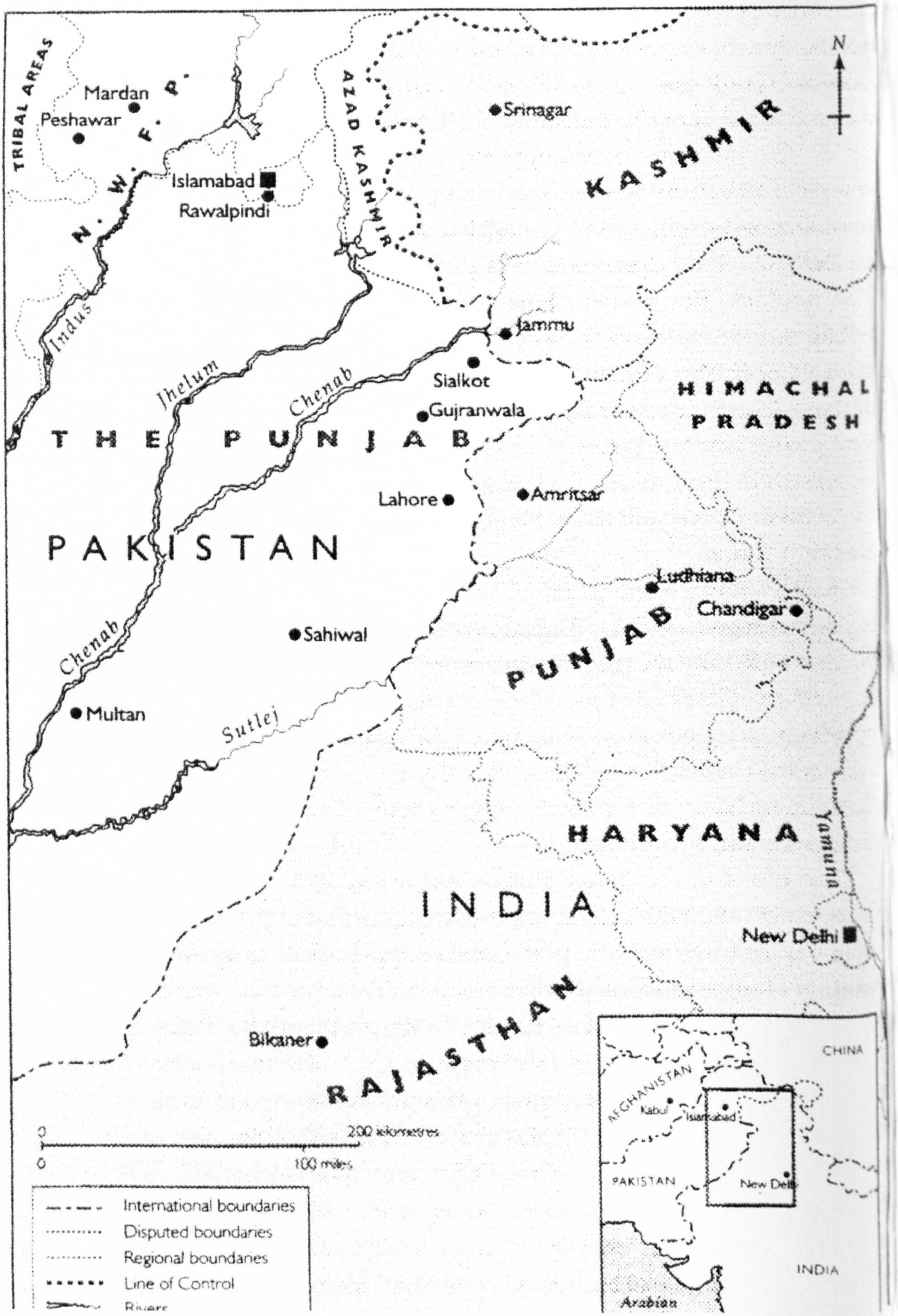
[75] It should be noted that the temperature inside a tank can rise to over 60 degrees Celcius.

**MAP # 2:** The India- Pakistan Border.

This map illustrates the Punjab & North/Central Rajasthan Theatres of Operations
Also, the map shows, in approximate terms, where the international border ends and the Line of Control begins.

Source: Neil Joeck, 'Maintaining Nuclear Stability in South Asia' : Adelphi Paper 312 p.26 ( London: IISS 1997 )

**Map 4** *The Sutlej River and the Indo-Pakistani Border*



This brings us to the other issue that needs to be considered - where on the South Asian battlefield could tactical nuclear weapons possibly be used ? The answer to this question will determine whether or not there is any battlefield use for nuclear weapons.

Theatres of Operations:

Any India-Pakistan conflict will take place in four major theatres, each varying in geography and, to a lesser extent climatically. The theatres of operations are:[76]

1) Along the Line of Control - Northern Kashmir region

2) Southern Jammu & Kashmir and Punjab sectors

3) North and Central Rajasthan

4) South Rajasthan and Gujarat

When looking at these theatres of operations, it must be borne in mind that the Line of Control in the Northern Kashmir region is not an internationally recognized border. It should also be noted that Punjab and Kashmir are politically very sensitive areas for the political establishments in both countries. It is, therefore, hardly likely that any major loss of territory in either of these two areas would be acceptable.

In the Southern Jammu & Kashmir and Punjab sectors, stretching down into North and Central Rajasthan, there are a series of extremely formidable obstacle defences, which are called ditch-cum-bunds by the Indians, and canals by the Pakistanis. These defences, combined with the existing natural ground features make large-scale

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[76] Lt.Gen.M.Thomas, 'An Analysis of the Threat Perception and Strategy for India' , *Indian Defence Review: January 1990*,p.63

mechanized operations virtually impossible.[77] These linear defences are extremely formidable, since the ditch-cum-bunds are liberally laced with diffused and well concealed concrete bunkers which have considerable defensive firepower and are difficult to locate, even with thermal imaging.[78] This effectively limits operations to defensive positions with only local offensive capability.

The Rajasthan and Gujarat regions present an entirely different scenario. In the Northern/Central Rajasthan theatre, considerable scope exists for the large scale use of mechanised formations in the desert and semi-desert sectors. It is in these sectors, the Thar desert and the Rann of Kutch, that the major armoured battles of the next India-Pakistan war are likely to be fought.[79] It is, therefore, not surprising that a complete Indian Strike Corps is earmarked for use primarily in this area.

The Thar Desert and Rann of Kutch also present the best possible place for tactical nuclear warfare.[80] The barren desert areas are ideal in that so-called collateral damage could be reduced. Moreover, any meaningful Indian gains in this area, that is beyond the major river lines, would threaten the very existence of the Pakistani state, thus prompting Pakistan to actively consider using nuclear weapons in the event of a major Indian breakthrough.

On the other hand, since the Indian Strike Corps will be operating in this area, so

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[77] loc.cit

[78] S.Bhaduri, 'The Artillery Division - Part II' , *Indian Defence Review: April 1992*,p.118

[79] P.Sengupta, 'Indian Armoured Doctrine and Modernization', *Military Technology: 5/1992*,p.30

[80] Thomas, 'An Analysis of the Threat Perception and Strategy for India', p.63

will be the bulk of India's formidable Corps of Air Defence Artillery. This means that any Pakistani attack against a major Indian formation would be met with heavy resistance from extremely dense and sophisticated CADA assets - not to mention fighter squadrons from the Indian Air Force. Therefore, any Pakistani attack stands a good chance of being repelled without reaching their assigned target.

India could also reduce the risk of nuclear retaliation by limiting its advance to the major river lines, or to between 60-80 km in the North/Central Rajasthan sectors.[81] This would mean that the existence of Pakistan would no longer be threatened while India would still occupy chunks of territory. Pakistan would probably be less willing to cross the nuclear threshold for such a limited Indian advance.

It is unlikely that either India or Pakistan would initiate nuclear warfare in either the Punjab or Kashmir regions purely for tactical gain. Indeed, for Pakistan the use of such weapons in Kashmir would almost certainly alienate the Muslim population of the Kashmir Valley. In the case of Punjab, Pakistan's military and political elites are largely drawn from that Province and as such it is extremely unlikely that they would take a risk as large as this for limited tactical gains. From a purely military standpoint, it should also be pointed out that the ditch-cum-bund defences and their network of concrete bunkers would probably survive a nuclear attack.[82] This would render a nuclear attack in this sector virtually useless.

Therefore, the only area in which nuclear weapons would be tactically useful is

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[81] Loc.cit.

[82] Maj.Gen.S.Singh, 'Nuclear War in South Asia - The Worst Case', *Indian Defence Review: January 1987*, p.70

in Rajasthan and Gujarat - for reasons which have already been given. Yet that land , especially in Rajasthan, Thar Desert sector, is of virtually no strategic importance. Would any militarily sane nation risk revealing the full extent of its covert nuclear program unless its very existence was threatened ? The answer is clearly no. Therefore, if India limits its territorial gains in this area, Pakistan would have no reason to resort to nuclear weapons.

There is one wild card in this scenario - the Line of Control. If India were to launch a major assault along the LoC - would Pakistan use nuclear weapons ? An examination of a possible war scenario will perhaps illustrate Indian planning more clearly.

War Scenario:

In 1987, the India army conducted a massive military exercise, 'Brasstacks', which outlined what was then a new tactical doctrine. No longer would the Indian army concentrate on operations in Punjab, as it had during the 1965 war, but would deploy massively powerful armoured formations in the Rajasthan sector with the aim of bisecting Pakistan at its weakest point in the Sindh Province.

This has been the model most often used and quoted by scholars in the literature available on possible war scenarios.[83] Moreover, it has been further argued that thanks to Pakistan's nuclear capability, an Indian offensive in the Sindh that met with success would be answered by a Pakistani nuclear strike. Since the defences in the Punjab are strong, it was therefore argued that as India's military superiority was hardly

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[83] An example being A.Tellis Stability in South Asia by the RAND corporation.

overwhelming, the nuclear factor may be creating an environment where war was almost impossible.

This model is, however, obsolete and far from creating a certain conventional stalemate, has simply led to the Indian army re-thinking its tactical doctrine. No longer will the Indian army attempt to make major territorial gains, but it will concentrate on occupying a small stretch of territory, not enough to threaten Pakistan's existence, but enough to force Pakistan to commit its forces where they will be met by superior Indian firepower which will then inflict maximum attrition[84]. The reason for this in part lies in the risk of nuclear warfare, but the main reason lies in the fact that previous wars in 1965 and 1971 have shown that major territorial gains are unlikely in a short war.

If a major Indian offensive occurs, it will occur in Kashmir. Never before has the Indian army attempted any offensive in Kashmir, but this time, thanks to the massive influx of troops into the State, an Indian offensive along the Line of Control is very possible. It could be argued that these troops are primarily for counter-insurgency operations. However, this does not explain why the formations coming into Jammu and Kashmir are bringing their artillery with them. Any fighting will in Kashmir will centre around a clash of infantry and artillery and as such, the induction of substantial artillery assets into the region must be seen as significant.

At the outset one thing must be made clear. Neither India or Pakistan believes

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[84] Personnalcommunications with Mr.'C' and Lt.Gen.'A' provided this new insight

that anything would be decided in a war lasting less than four weeks.[85] India bases its plans on a period of intense fighting lasting six to eight weeks followed by a period of major, but less intense fighting lasting up to four more weeks. War Wastage Reserves are calculated on this basis and so if a war lasts only two weeks or thereabouts, the most that can be hoped for is for heavy attrition of the enemy forces.

India has therefore moved away from the Brasstacks plan of bisecting Pakistan in the Sindh and threatening Islamabad with encirclement to a more modest objective of destroying as much of the Pakistani military as possible. Pakistan's nuclear weapons provide some deterrence against any Indian move to make deep thrusts into its territory and against any possible bisection of Pakistan, they are of no use in a war aimed solely at inflicting maximum attrition against Pakistani military forces.[86]

The Indian army has two Strike Corps, 2 Corps & 1 Corps, assigned to the Rajasthan and Punjab sectors respectively.[87] The Strike Corps are described in an earlier section, but each is composed of one armoured division and several infantry divisions and supporting units. Each will also have an artillery division attached. There is another Strike Corps - 21 Corps which is not yet fully operational.

In the Brasstacks model, these were the two formations Pakistan was most concerned about and their continued presence in the Rajasthan and Punjab sectors will

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[85] Interview with Mr.'C' in January/February 1998, interview with Air Marshal 'E' and with Mr.'F' on 23 March 1998. This is further confirmed in an interview with Lt.Gen. M.Thomas that is found in W.P.S.Sidhu, 'Chinks in the Armour', p.129 in *India Today*: November 15 1991

[86] P.Sawhney, 'If Pakistan and India go to War', *The Asian Age*: 12-13 November 1994,p.13

[87] P.Sawhney, 'Prithvi's Position: India Defends its Missile', *International Defence Review: July 1997*,p.45

ensure that Pakistan cannot consider any major troop redeployments in either sector. Under current plans, India intends not to advance more than 60-80km in the North/Central Rajasthan sector and only up to the major river lines in South Rajasthan/Gujarat, Pakistan's existence would hardly be threatened.[88]

However, it must be remembered that India and Pakistan will be fighting a political war as much as a military one and any loss of territory is considered a major political embarrassment. This means that Pakistan would invariably have to attempt a counterattack against Indian forces occupying any of its territory. Its forces would then be drawn into a battle of attrition against Indian forces, a battle that they would lose. If the current build up of air defence assets, upgrading of armour and anti-tank munitions and the increase in artillery within the India army is seen in light of this post-Brasstacks tactical doctrine, it is abundantly clear that India is building up its forces to ward off any Pakistani counterattack, inflicting devastating losses on the attackers.

In the Southern Jammu & Kashmir and Punjab sectors, the huge fixed fortifications described previouslyr effectively limit the scope of any Indian operation. India is highly unlikely to attempt a major offensive in this sector for two reasons. The first is the extent of the fortified defences in this sector, but the second is far more significant and goes to the core of Pakistan's vulnerability versus India.

The real vulnerability of Pakistan lies, not in a lack of 'strategic depth', but in the fact that so many of its major population centres and politically and military sensitive targets lie very close to the border with India. As was mentioned earlier, this negates the

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[88] M.Thomas, 'An Analysis of the Threat Perception and Strategy',p.63

tactical use of nuclear weapons in the Punjab sector in particular. However, should India threaten Lahore, for example, Pakistan could be compelled to attempt a nuclear strike against an Indian civilian target.[89] As such, it is hardly likely that India would want to risk a major advance in Punjab. Aims in this sector would be limited to holding Pakistani forces in a defensive deployment pattern while inflicting maximum attrition with 2 Corps and 21 Corps.

Along the Line of Control, however, the situation is very different. One of the consequences of the Kashmir insurgency is that India has transferred several divisions to the area to reinforce the troops already there and bringing total troop strength in this sector to over 250,000. The Indian divisions and brigades also brought their supporting artillery with them and this combination - which is far in excess of what is needed for defensive operations - enables Indian planners to contemplate a major offensive along the Line of Control with every chance of success.

The importance of the term Line of Control cannot be understated. Pakistan clings to the illusion, in official pronouncements at any rate, that its part of Kashmir is not really part of Pakistan. As such, it has always refused to recognize the Line of Control as the international border with India. This is something that India intends to exploit to the fullest.

Pakistan, on the other hand, appears to work to a different strategy. From the time of the 1965 and 1971 wars, up until India's Brasstacks exercise, emphasis was

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[89] During the 1965 war, the Indian army was poised to capture Lahore. Lahore, the heart of Pakistani Punjab, would be apolitically devastating blow to Pakistan. As such Pakistan would probably take all stepd to guard against a repeat of the 1965 experience

**MAP # 3:** Kashmir and the Line of Control

This map shows the Line of Control and the disputed regions of Kashmir.It also shows the Siachen Glacier where an undeclared war is currently being waged between India and Pakistan.

Source: Neil Joeck, 'Maintaining Nuclear Stability in South Asia': Adelphi Paper 312, p.19 ( London: IISS 1997 )


0
200 kilometres
0
100 miles
TAJIKISTAN
AFGHANISTAN
CHINA
International boundaries
Disputed boundaries
Line of Control
Claimed by India and China
Rivers
Capital cities
N
Indus
Siachen Glacier
AZAD KASHMIR
Srinagar
KASHMIR
Indus
Islamabad
Rawalpindi
PAKISTAN
Lahore
Amritsar
CHINA
AFGHANISTAN
Kabul
Islamabad
PAKISTAN
New Delhi
INDIA
INDIA

placed on the static defence of the Line of Control and the border.[90] However, in light of India's substantially enhanced offensive capabilities, Pakistan realised that this 'stand and fight' doctrine would lead to serious Indian penetration of Pakistani territory with the Pakistani army being unable to manoeuvre to meet the threat. Counterattacking formations would then be destroyed piecemeal.[91]

Pakistan has therefore adopted a new strategy - the Riposte. This is remarkably simple in concept in that Pakistan would accept the loss of territory in Indian penetrations, but would conduct a limited advance along narrow fronts with the aim of occupying territory near the border to a depth of 40-50km.[92] Pakistan believes that this would give it a bargaining chip to be used in the aftermath of a ceasefire brought about by international pressure after 3-4 weeks of fighting.

The Pakistanis, to some extent, still assume that India will attempt deep penetrations into the territory. Moreover, it appears that though the Pakistani army is well prepared for this new doctrine, there is an inadequate appreciation of the threat posed by Indian air power to the attacking formations. Some planning has been based on the highly unrealistic assumption of local air superiority and as such these plans may go seriously awry.[93]

So what will a future India-Pakistan war look like ? There are a number of good

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[90]B.Cloughley, 'Pakistan strives to match aims and capabilities', *International Defence Review: March 1995*,p.73

[91] ibid, p.74

[92] loc.cit

[93] loc.cit.

books on the 1965 and 1971 wars and some excellent accounts of the tactical thinking behind Exercise Brasstacks are available.[94] These, however, are not of much use at present. However, perhaps the best and most realistic war scenario was painted by defence journalist Pravin Sawhney in the Asian Age newspaper in November 1994.[95]

Holding formations in both India and Pakistan can man their forward defensive positions and fortifications in less than 24 hours. However, Corps level reserves with large stockpiles of munitions will take between 24 to 72 hours for mobilization after being given their orders. In this regard, both armies will be evenly matched in the first 24 hours since the Pakistani units have to travel a shorter distance to their forward positions.[96]

Pakistan's Army Reserve North is based in the Kharian/Mangla complex and would need to travel only 200km to its forward concentration areas or even their assembly areas where regrouping before an offensive is done.[97] This could be done at extremely short notice and is consistent with Pakistan's pre-conceived offensive plans as outlined in the Riposte doctrine. Army Reserve South, which is based in the Multan area can also be available for operations in a similar time.

While many of India's formations may take up to 72 hours to be fully deployed,

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[94] Some examples being Major General Harbaksh Singh, War Despatches (New Delhi: Lancer 1991) and Major K.C.Praval The Indian Army after Independence (New Delhi: Lancer 1993)

[95] This account in *Asian Age*: 12-13 November 1994, remains the only post-Brasstacks work to explore the new tactical doctrine governing Indian Army operations against Pakistan.

[96] Some Indian formations will be drawn from Central and Eastern India and they will take some time to arrive.

[97] Sawhney, 'If Pakistan and India go to War', *Asian Age*: 12-13 November 1994, p.13

two out of India's three Strike Corps, 1 Corps & 2 Corps, are so positioned as to match the mobilization timings of Army Reserve South. As of now, it is not known if the third Strike Corps, 21 Corps, will be available at such short notice.[98]

India could, in theory, disrupt the early deployment of Army Reserve North if the Indian Army's Northern Command denies deployment space with the pre-emptive mobilization and deployment of Northern Command's theatre reserves. In 1994, Sawhney was unconvinced that this was possible owing to the employment of so many units of the Indian army on internal security duties in Jammu & Kashmir.[99] However, since 1994, the number of paramilitary units in Jammu & Kashmir has grown and the Indian army has deployed almost thirty thousand men from its Rashtriya Rifles battalions.[100] These would take at least some pressure off the regular army in counter-insurgency operations. Moreover, the number of regular army troops in the state seems to have grown.[101] These could provide the Indian army with sufficient troops in theatre to deny Pakistan's Army Reserve North deployment space, thus neutralizing any advantage Pakistan had in this regard.

The problem with assessing whether or not Indian troop strength is adequate to

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[98] Inteviews with Mr.'C'in January-March 1996

[99] loc.cit

[100] India's paramilitary forces are reasonably well trained and fairly well equipped. The three main paramilitary units operating in Jammu and Kashmir - the Central Reserve Police Force, the Border Security Force and the Assam Rifles - possess almost the full range of infantry weapons. The Border Security Force also has several artillery units, while the Rashtriya Rifles battalions are almost clones of their regular army counterparts.

[101] It is not known exactly how many regular troops India has deployed in Jammu and Kashmir. However, a figure of 250-300,000 is feasible. Most of these are not assigned to counter-insurgency roles and are an indication of possible Indian offensive plans in the Kashmir theatre.

the task of neutralizing Army Reserve North's deployment is that the internal security situation in Jammu and Kashmir is very variable.[102] It is possible that the paramilitary forces and the Rashtriya Rifles will free a large number of troops for conventional operations. Moreover, it is possible that up to three divisions, with over forty thousand men, could be moved from the China border without seriously degrading India's defences against a Chinese assault. These troops are held by Central and Eastern commands, and have actually been earmarked for out of theatre operations.[103]

In the case of Army Reserve South, the Indian Air Force has the potential to cause havoc with their deployment by beginning an intensive interdiction campaign in the Gujrat (Punjab)-Sialkot-Gujranwala area.[104] However, this would make India the aggressor in any conflict. Sawhney argues that this would make the Indian government reluctant to permit this, however, that is not at all certain.[105] The Indian government may well engineer incidents to give an excuse, however flimsy, for the Indian Air Force to begin such an interdiction campaign.

In order to further reduce the risk of a Pakistani nuclear strike, it is possible that India, through the United Nations, might make certain pledges to Pakistan. These might include a pledge not to deliberately attack a civilian target, to refrain from attacking civilian nuclear installations and a promise not to initiate the use of weapons of mass

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[102] The situation in Kashmir is something of an enigma. On one hand, the Indian government is claiming an improvement in the overall internal security situation while on the other analysts like Mr.'C' feel that the situation is still grave

[103] Sawhney, 'If Pakistan and India go to War', p.13

[104] loc.cit

[105] loc.cit

destruction unless attacked with such weapons. India could also make it clear that it would abide by these terms only if Pakistan agrees to do the same. Should Pakistan not agree, India would probably assume that a nuclear strike would be forthcoming.[106]

Let us for the moment assume that India does not deny Army Reserve North deployment space and that the Indian government does not sanction the launching of preemptive air strikes. Both India and Pakistan will have a relative parity in manpower and combat formations at the start of any conflict. India will be able to bring up some very large combat formations from central and eastern India, but Pakistan would be almost fully committed. A force of three infantry divisions plus some independent brigades under 11 & 12 Corps would be transferable from the Peshawar and Quetta areas respectively, but with very little artillery and armour.[107] Moreover, if there is any serious escalation of fighting in Afghanistan, Pakistan may be less willing to denude its Afghan border of all regular army formations.[108]

The Indian objectives in the Northern sector, in Jammu & Kashmir, are somewhat unclear. The Indian Defence Review Research Team argued that the capture of Skardu to cut off the main glacier zone in Baltistan would be a major objective.[109] Moreover, a strong offensive aimed at capturing Muzzafarabad from the North and the

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[106] There is no real evidence to suggest that India might make such a pledge. However, it is certainly very feasible that India would do something like this if only in an attempt to limit Pakistan's options.

[107] loc.cit.

[108] If the Pakistani backed Taliban forces suffer any serious reverses in the Kabul area, the moving of Pakistani forces to the Indian border is even less likely.

[109] IDR Research Team, 'Operational Scenario Alpha', *Indian Defence Review: July 1992*, p.22

South of the Jhelum, and the neutralization of the Haji Pir (Bedori ) Bulge would have to be undertaken.[110] The Indian army would also attempt to capture the Mirpur-Mangla Complex with the view of presenting a clear and present threat to the Pakistani national capital region.[111] Finally, to cope with the threat posed by Army Reserve North, Indian formations would make a penetration into the Sialkot sector with the sole aim of bottling up and denying deployment space to the Pakistani formations, thus ensuring its eventual destruction.

The scenario described above leads to the question as to whether Pakistan would launch a nuclear strike in response to the threat posed to its national capital. The Indian Defence Review Research Team does not answer this question in any way. Pravin Sawhney describes a far more detailed scenario which, while essentially similar in concept, seems to differ in some major details.

Sawhney, in his scenario, argues that the Indian army would have a choice - attacking into either Ladakh-Baltistan or into Pakistan Occupied Kashmir ( POK ) and that the army would prefer an ingress into the latter along the Line of Control.[112] He also argues that the main thrust would be in the Jammu division between Poonch and Chammb with a secondary thrust into the Tithwal-Keran sectors.[113]

Northern Command might also suggest that a limited offensive be conducted to

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[110] loc.cit

[111] loc.cit. It is easy to forget that Islamabad and Pakistan's Army Headquarters at Rawalpindi are extremely close to the Line of Control.

[112] Sawhney, 'If Pakistan and India go to War', p.13 POK is known as Azad Kashmir to the Pakistanis. In this thesis the Indian designation- POK- will be used.

[113] loc.cit.

the west of Zojila in the Dras-Kargil sectors.[114] The aim here would be to cut off the lines of communications of the Pakistani brigade based near the Shingo and Indus Rivers. These operations will call for troops specially trained and equipped for operations in mountainous and hilly terrain and to this end, the three divisions previously earmarked for use against China would be invaluable. Moreover, select formations from these forces already send divisional reconnaissance groups into Kashmir for terrain familiarization.[115]

That these divisional reconnaissance groups have been conducting terrain familiarization for quite some time gives rise to the idea that India has been planning for a major offensive in the Jammu & Kashmir sector for a long time.

Pravin Sawhney assumes that the attack in Kashmir would be launched first with two mountain divisions concentrated to begin operations in the directions of Jhanghar-Mirpur and Nowshera-Bhimber with the ability to switch between the two.[116] A third division would be allocated to the Mendhar-Kotli-Mirpur axis in two columns. Pakistan would probably understand that some move was afoot at this stage to the sector defended by 19 Infantry Division. The Pakistanis would then move the 7 & 9 infantry divisions based at Peshawar to assist in their defence.[117] However, it is not certain that these two divisions would be available entirely since the Afghan border is volatile at the best of times and the situation in Afghanistan is very fluid.

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[114] loc.cit.

[115] loc.cit.

[116] loc.cit

[117] ibid p.18

Nonetheless, assuming these formations begin an eastward movement, Pakistan's Army Reserve South would start mobilizing at Multan. At this stage, India's three Strike Corps would begin a forward movement. The plan as envisaged by Indian planners is for 1 Corps to face Army Reserve North and 2 & 21 Corps to face Army Reserve South.

The offensive would begin in the Ladakh sector with two brigades attacking from Kargil along with two brigades from the Northern Kashmir holding division tasked with straightening the Line of Control in the Tithwal-Bugina bulge sector.[118] The three mountain divisions mentioned earlier would then commence their offensive which would probably face extremely stiff resistance from the Pakistani infantry divisions facing them. Compared to the dashing manoeuvre warfare employed during the Brasstacks exercise, the current Indian army high command is fully convinced that their present offensive plans would be more akin to the 'meat-grinding' assaults of the Second World War.

As Pakistan's strategic depth was eroded around Islamabad and with its Army HQ at Rawalpindi fixed on the worsening situation at Mirpur, Army Reserve North would be committed to action. ARN would attempt an offensive aimed at the Jammu-Pathankot corridor while crossing the river Ravi aimed at threatening Gurdaspur-Pathankot.[119]

These operations would be met by India's 1 Corps which would engage Army Reserve North in a savage battle of attrition, forcing Pakistan to move 9 division to the

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[118] loc.cit.

[119] loc.cit.

Mirpur sector, where the Indian offensive continues, while 7 division moved, along with 30 Corps, to reinforce Army Reserve North. In the meantime, the Indian and Pakistani air forces would engage in their own battle of attrition, with the former waging a heavy counter-air offensive whilst engaging in a massive offensive-air-support operation for the Indian army.

With the Indian offensive overcoming its opponents in the Kashmir region and Army Reserve North, and its reinforcements, engaged with India's 1 Corps in a battle of attrition, Pakistan's army high command would prefer that Army Reserve South be kept out of action as long as possible. However, since the whole object of the Indian plan is to inflict heavy attrition on Pakistan's armed forces, it would be essential for Army Reserve South to be neutralized.

Sawhney believes that India would use its Desert Corps (12 Corps) to draw ARS into action.[120] 12 Corps would launch a limited offensive aimed south of Rahimyar Khan to which Army Reserve South would respond with a thrust to its north. The Indian Holding Corps, with their RAPIDS, would probably find themselves under heavy pressure from the powerful ARS. At this stage, with ARS fully committed, India would spring its trap with 2 & 21 Corps, along with massive air support, launching out together along a very narrow front aimed at punching through 31 Corps and falling on the soft under-belly of Army Reserve South which would then be destroyed in detail.

In this scenario, the fighting which has lasted between two and four weeks, has left Pakistan's armed forces severely depleted, if not almost destroyed. Army Reserve

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[120] loc.cit

South has been destroyed along with the Pakistani formations in the Rajasthan/Gujarat sector. Indian forces have made gains along the Line of Control, severely eroding Pakistan's strategic depth in the region of Islamabad and Army Reserve North and its reinforcing formations have been mauled by 1 Corps, Indian Holding Corps and the Indian Air Force.

What is significant is that Pakistan would not have suffered any major territorial losses. No Indian offensive actually seized much land and in no case was the existence of Pakistan actually threatened. While nuclear threats and counter-threats might be traded, Pakistan would probably not feel quite so compelled to go nuclear as it would if its very survival was at stake.

India's gamble is that with such a mauling of its military capability and since Pakistan has neither the money or the resources to re-build such a large and powerful military machine again, Pakistan might be far more amenable to a permanent settlement of the Kashmir dispute and other outstanding matters. Since India would hold a major advantage in that Pakistan could no longer rival India militarily, such a settlement would probably go in India's favour. At least that is the Indian *plan*. Whether or not any permanent settlement over Kashmir can be achieved after such a war remains a matter for speculation.

The most important point to note in this scenario is that in no case would India be seeking to grap large areas of Pakistani territory. Pakistan's existence will not be endangered so would Pakistan risk using nuclear weapons on the battlefield ? Having said this, it should further be pointed out that there is a lot of room for misinterpretation

in this scenario. For example, will Pakistan be able to distinguish between a limited Indian advance and a full scale invasion ? At what stage would Pakistan consider its existence to be threatened ?

After discussions with a number of retired Indian officers - specifically about this question of misinterpretation - the only answers that could be provided revolved around the fact that a limited Indian penetration would be along a broad front and have limited depth while a full invasion would have areas of narrow but deep penetrations into Pakistani territory.[121] The officers believed that Pakistan would have no difficulty in differentiating between the two and as such the question of misinterpretation did not arise.

The Tactical Use of Nuclear Weapons:- Advantages & Disadvantages:

Having looked at the areas in which nuclear weapons might be applied, it is now appropriate to examine the 'pros' and 'cons' of using nuclear weapons on the South Asian battlefield. The first question that has to be answered is how nuclear weapons can be used tactically ?

Unlike the American and Russian - and possibly the Chinese - armed forces, the Indian and Pakistani military establishments are unlikely to have access to weapons in the very low yield - 0.1 - 4 kiloton - range.[122] Therefore, the nuclear weapons most likely to be used on the South Asian battlefield might range between 5 and 20 kilotons.[123]

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[121] Interviews with Mr.'C' & Lt.Gen. 'G' on 25 March 1998

[122] These weapons, while technically feasible, are difficult to assemble without doing at least one test. Enhanced radiaton weapons are also possible, but again would need to be tested.

[123] S.Singh, 'Nuclear War in South Asia - The Worst Case Scenario', p.65

These weapons are fairly large - by Western battlefield standards - and it is extremely difficult to differentiate between 'tactical' and 'strategic' nuclear weapons in the India-Pakistan context.[124]

For defending forces, either Indian or Pakistani, nuclear weapons might be used to block attacking units crossing obstacles - e.g. rivers.[125] To this end, the defending forces would adopt a mobile defence posture, which would present a difficult target for a retaliatory nuclear strike. The nuclear weapons would be used as the attacking force concentrates to overcome a defensive position or obstacle.[126] This would require a degree of advanced warning to the defending units and this might be detected.

As far as offensive operations are concerned, these would necessarily be planned around the use of nuclear weapons. The attacking forces would remain dispersed and only concentrate rapidly to attack.[127] The objective of this is to present as few worthwhile nuclear targets as possible. In addition, the attacker would aim to destroy the enemy's nuclear capability and, perhaps more importantly, the controlling Headquarters.

In order to perform these tasks, in both defence and offence, the armies must possess mobile reserves and strike formations with a preponderance of armour and mechanized infantry and possess excellent intelligence.[128] In this regard, both the Indian

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[124] K.V.Krishna Rao, Prepare or Perish, p.404

[125] Loc.cit

[126] Loc.cit.

[127] Loc.cit. General K.V.Krishna Rao gives one of the clearest and most concise accounts of how nuclear weapons might be used in both offensive and defensive operations.

[128] K.Sundarji, Blind Men of Hindoostan, p.91

and Pakistani armies have such forces in sizeable numbers, the Indian Strike Corps and RAPIDS and Pakistan's Army Reserve North and South. This mechanization was carried out as part of the evolving conventional military doctrine, but, as can be seen, also prepares both armies for the use of battlefield nuclear weapons in South Asia.

However, there are a number of very serious constraints that mitigate against the battlefield use of South Asia. The first, and perhaps the most important, of these is the stigma attached to being only the second country in the world to use nuclear weapons. Certainly India, for example, would be very much restrained from using nuclear weapons in the initial stages of any attack on Pakistan.[129] Similarly, Pakistan would be very wary of using nuclear weapons for tactical gain. Both sides would only use nuclear weapons in the event of their very existence being threatened, not just to gain a battlefield advantage.

In addition to this, there are limitations to the success of a nuclear strike on an enemy position. A Pakistani attack on an Indian Strike Corps, as mentioned earlier, would be met by intense anti-aircraft fire - in addition to Indian fighters. This does not apply, at least not to the same extent, to an Indian attack on a major Pakistani formation, owing to the limited variety of air defence weapons available to the Pakistani army.[130]

An attack on a well dispersed, mechanized combat force would not be

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[129] Col. T.N.Dupuy, Future Wars ( New York: Warner Books, 1992 ), p.79

[130] The risk to Pakistani aircraft and missiles should not be underestimated. Moreover, imagine the embarassment the successful interception of an aircraft carrying a nuclear warhead would cause. The gamble would have failed and India would have an excuse to retaliate with nuclear weapons.

catastrophic.[131] Armoured vehicles in both armies are designed to operate in NBC conditions and furthermore, unless the unit is almost at the centre of the blast ( 'Ground Zero' ) it is highly possible that the MBTs and APCs would provide significant protection from the blast and radiation effects.[132] This means that the principal offensive formations of both armies would be rather less vulnerable targets than would be ideal.

The holding formations - heavily dug in and in well-constructed concrete bunkers and behind the ditch-cum-bund and canal defences - would be more vulnerable. However, even these, with the protection afforded by the fixed defences might not suffer as much as hoped as these defences would probably survive a nuclear strike.[133] The most vulnerable units would be lone battalions or brigades in isolated areas.[134]

There is also a major problem of providing intelligence to friendly forces in the area of a nuclear blast. It is unlikely that either army would want to have sizeable numbers of friendly forces caught either at the centre or in the vicinity of a nuclear strike. In order to prevent this, instructions for dispersal, issuing of protective equipment and constructing shelters would have to be given. There may also have to be large scale issues of NBC protective gear and decontamination and monitoring equipment. Moreover, medical units would also have to be alerted to the possibilty of the use of nuclear weapons so as to cater for battlefield casualties.

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[131] Sudarji, Blind Men of Hindoostan, p.137

[132] Lt.Gen.E.A.Vas, 'India's Nuclear Options in the 1990's and its Effect on India's Armed Forces', p.21 in *Indian Defence Review: January 1986*

[133] S.Singh, 'Nuclear War in South Asia - The Worst Case Scenario', p.70 Troops in concrete bunkers - with thick walls - have a good defence against both blast and radiation effects of a nuclear strike.

[134] Sundarji, Blind Men of Hindoostan, pp.36-41

These preparations would probably be noticed by the enemy, thus eliminating the essential element of surprise.[135] In addition, given the fact that only the Southern Rajasthan/Gujarat sectors are really suitable for tactical nuclear warfare, the disastrous effects of using NBC gear on combat efficiency would have to be taken into account.[136]

Perhaps the ultimate deterrent to the tactical use of nuclear weapons is the threat of massive retaliation.[137] In the absence of a clear nuclear doctirne, neither side is fully aware of where the nuclear threshold lies.[138] Would either India or Pakistan risk a concentrated nuclear attack on each other's cities in retaliation for a nuclear strike on a battlefield target ?[139] This is hardly likely, however, in the absence of clearly stated policies and nuclear doctrines, such a miscalculation cannot be ruled out.[140] Ultimately tactical nuclear restraint revolves around the vulnerability of South Asian population centres - civilians will pay the price for any nuclear miscalculation on the battlefield.

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[135] It is possible that these preparations will not be noticed and the attack would achieve the desired surprise. However, is either country prepared to take the risk if it does not achieve the desired results ?

[136] K.Sundarji, 'Chemical Warfare & South Asia' in *The Hindu*: February 21 1997

[137] It must be remembered that a 20 kiloton blast - not a particularly large weapon - on a city -even a Western city - would have catastrophic consequences. It should also be stressed that India, in particular has access to weapons that have yields in excess of 150 kilotons - possibly more.

[138] This lack of clarity indicates that deterrence, as understood in the West, may not exist in South Asia

[139] Pakistan is particularly vulnerable owing to the proximity of its cities to the battle area

[140] Sundarji, Blind Men of Hindoostan, pp. 131-140

## *Chapter Five:* Nuclear Attacks on Civilian Targets: - South Asian Armageddon

The most horrifying aspect of nuclear warfare is the prospect of civilian targets being bombarded with nuclear or thermonuclear weapons. This is also the ultimate guarantor of deterrence as neither side would want to lose large numbers of its civilian population and its industrial base to nuclear attack.

The effects of nuclear strikes against countervalue targets in South Asia have to be assessed differently to the effects in the event of a nuclear war between the Soviet Union and NATO at the height of the Cold War. First of all, as discussed in an earlier chapter, the weapons available to South Asian countries are of a smaller yield compared to the megaton monstrosities possessed by the big five nuclear powers.[1] Pakistan in particular has access to weapons limited to the 15-50 kiloton range. India has the capacity to manufacture both thermonuclear and boosted-fission weapons, but these seem to be earmarked more for use in the event of hostilities with China.

While the weapons are smaller, the conditions existing in South Asian metropoles ensure that any nuclear attack will cause devastating casualties. The cities are crowded, buildings are of poor materials and fire-fighting facilities are inadequate even in peacetime. Moreover, medical facilities for treating cases of radiation burns etc. are limited - especially in the case of Pakistan.

In this discussion of attacking civilian targets, an analysis of the effects of nuclear strikes will be explored, as will an overview of the likely targets. Any nuclear attack on a civilian target depends on the ability of the attacking force to penetrate the

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[1] See Chapter Two pp.65-70 & pp.85-87

defences and the effects of the attack depend on the efficacy of the civil defence organization. These will be also discussed in some detail. One final point must be made on the ability of Indian and Pakistani forces to attack civilian targets. India's delivery systems, manned aircraft and missiles, are capable of hitting any target in Pakistan. Pakistan's systems are not yet able to reciprocate as they can only cover a limited area.

Before analyzing the impact of nuclear weapons on South Asian urban centres, a few assumptions have been made regarding the size and composition of the nuclear forces ranged against civilian targets. As discussed in earlier chapters, Pakistan is unlikely to possess more than 30 20-kiloton atomic weapons at present. In India's case, a minimum of 85 such weapons is a reasonable estimate. Any boosted-fission or experimental thermonuclear weapons in India's possession are assumed to be earmarked for possible use against China.

These assumptions have very serious implications for speculating on 'city-busting' strategies adopted by both countries. With the limited number of weapons available, Pakistan would have to carefully choose its targets in order to achieve maximum effect. It cannot afford to waste effort on small military targets or on civilian targets of little political significance. In addition, with so few weapons available, Pakistan would have to carefully weigh the penetration prospects of their delivery systems. This would ensure that Pakistan would choose to attack targets as close as possible to its air bases and this would preclude attacks on the majority of India's major industrial targets and on the bulk of its military defence installations. Even Pakistan's ballistic missiles cannot as yet cover much of India.

India, on the other hand, does not face these problems. Because of Pakistan's limited geographical depth, all Pakistani targets lie within range of 'Prithvi' SSMs and Indian MiG-27s and Jaguars. Moreover, Pakistan is even more vulnerable than India since most of its major cities lie very close to the Indian border.

Once the nuclear weapons reach their targets, however, the effects in both countries would be catastrophic. Even operating under the limitations given above, a nuclear exchange in South Asia would easily result in over a million civilian deaths. The urban centres of South Asia are amongst the most crowded in the world and their large slum areas would become death traps as the blast effects of even 20 kiloton weapons would wreak havoc.

## Attacking Strategic/Civilian Targets

The first question that must be asked is what are the likely targets in South Asia. The second issue is whether strategic counterforce targets be differentiated from civilian countervalue targets in either India or Pakistan. The second of these is easiest to answer, since no strategic target in South Asia is truly isolated from a major urban centre. For example, Mumbai houses BARC and India's Western Fleet, and of course, a huge civil population. Similarly, any attack on India's Western Army Command Headquarters at Chandimandir will have devastating consequences for the neighbouring city of Chandigarh.

The first question is rather more difficult since the ranges of many delivery systems are heavily dependent on a number of external factors, such as carrying external

fuel tanks and the actual weight of the nuclear weapon carried. However, for the purposes of this chapter the following assumptions are made:[2]

<u>For Pakistan:</u> - 30* 20 kT weapons
- 40* F-16 fighter-bombers - range of 547km with 3000kg payload
- 140* Mirage III/V - 685km with 800kg payload + 3 drop tanks
- 50* M-11 missiles - payload of 500kg & 300km range.

<u>For India:</u> - 85-100* 20kT weapons
- 110 * Jaguars - 852km range with 4500kg payload
- 200* MiG-27 - 540km with 2000kg payload + external fuel
- 70* MiG-23 - 400km with external fuel
- 75* Prithvi SSM - payload of 500-1000kg & range of 150-350km

These are the forces likely to be available to either country in the event of war.

However, it does not mean that all these forces will be earmarked for a nuclear strike .

These figures lead to some rather interesting points. Firstly, New Delhi falls just short of the range of the M-11 while Mumbai falls just short of the realistic range of the F-16s. This adds a new dimension to the nuclear vulnerability debate as otherwise extremely capable scholars like S.Rashid Naim who have always given much higher ranges for Pakistan's strike aircraft.[3]

What this also means is that most of India's nuclear reactors and nuclear facilities, especially the Indira Gandhi Atomic Research Centre in South India and BARC near Mumbai, are just out of the reach of Pakistani delivery systems. Mumbai is

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[2] See V.K.Nair, <u>Nuclear India</u> ( New Delhi: Lancer International, 1992 ), p.50 and earlier chapter on Indian & Pakistani delivery systems - missiles & manned aircraft. Range/Payloads are, of course, dependent on external fuel

[3] S.Rashid Naim, 'Asia's Day After: Nuclear War Between India and Pakistan ?' in S.P.Cohen ed., <u>The Security of South Asia: American and Asian Perspectives</u> ( Urbana & Chicago: University of Illinois Press, 1987 ), p.258-259. The assumptions here are based on the maximum range of these aircraft flying a hi-hi-hi attack profile and external fuel. This is not practical in reality as this dramatically increases the vulnerability of the aircraft.

over 800km from the nearest Pakistani airbase while Madras is over 2200km and the installations in central India are between 800-1000km away.[4] Again, it must be stressed that while the range of the Pakistani aircraft can be increased by adding external fuel and by altering the attack profile to a high altitude ingress and egress to and from the target. This would have the effect of massively reducing the aircraft's maneuverability and increasing its radar cross section, if external fuel is used, and enhancing the aircraft's vulnerability to air defences if a high altitude attack profile is adopted.

India does not face these problems against Pakistan, thanks to Pakistan's very narrow geography. Indian Jaguars can reach almost the whole of Pakistan, while the large MiG-27 fleet can hit all of Pakistan's major cities, owing to their extremely close proximity to the Indian border. The key to any successful strike by either country are the opposing defences.

Air Defences:

Any nuclear strategy based around attacking civilian targets, either in a first strike or in retaliation, has to have a reasonably good chance of reaching their targets safely. To this end it is imperative to examine the air defenses protecting key strategic military and civilian targets in the Indian subcontinent.

Both India and Pakistan have advanced air defense ground environment systems. These link a large number of air defense radars of varying origins into an effective air defense network. This network coordinates the responses of powerful fighter-interceptor

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[4] J.Singh, 'The Wars that Never Were', *India Today*: February 28 1994 ,p.64

units and, in the case of India, a large number of surface-to-air missile squadrons.

India and Pakistan face very different problems regarding air defense. India has the enormous problem of contending with its vast land area while Pakistan has to deal with its lack of depth. Both nations face financial constraints, although this has not prevented them from acquiring sophisticated air defence equipment. In addition, both India and Pakistan have to contend with the increasing sophistication of the attacking force available to both sides.

In recent times, India has embarked on a two-fold approach. Its nuclear strike forces have been dramatically upgraded with the 'Prithvi' missile and upgrades to the Jaguar and MiG-27 fleets. In addition, Indian air defences are being expanded and re-equipped with weapons and sensors that would render an attack by either Pakistani missiles or aircraft an extremely risky proposition. Pakistan, on the other hand, has been unable to procure modern surface-to-air missiles in any meaningful numbers and lacks an effective defence against either 'Prithvi' or, to a certain extent, Indian aircraft. This is a remarkable fact given the size of the potential Indian nuclear strike force.

Strategic Air Defences in India

India, with its vast airspace, maintains an advanced Air Defence Ground Environment System. This system, along with the civilian Air Traffic Control, is responsible for the detection, identification and, if necessary, the interception of aircraft in Indian airspace. The Air Defence network is also in the process of being upgraded to cater for ballistic missile threats.

Before examining the system in detail, a quick overview is in order. India's air defence network is essentially divided into two parts - the Air Defence Ground Environment System and the Base Air Defence Zones. These two components are closely linked and share information relating to air defence tasks.

The Air Defence Ground Environment System consists of an array of radars along the Western and Northern Borders as well as a network of mobile systems in the North East and South of the country. The ADGES network is responsible for overall airspace management and detection of intruders. The ADGES also controls and coordinates the air defences for large area targets. The Base Air Defence Zones, as the name implies, are tasked with the defence of high value targets - air bases, nuclear installations and key military installations. The BADZ is a scaled down ADGES network, limited to an arc of 100km. The BADZ is a far more concentrated air defence environment than the ADGES and provides the only gap-free air defence cover in most sectors.

In addition to these networks, India is now establishing an anti-tactical ballistic missile screen - with new radars and weapons. It is not clear whether this will be incorporated into the BADZs or whether it will comprise a separate network. This ATBM screen is slowly taking shape and news of its structure is still awaited.

## Indian Air Defences: Sensor Network

The Indian Air Defence Ground Environment System employs a three tier detection network. While this system is currently in the process of a major

modernization program, the basic structure of the ADGES network will remain unchanged. The first layer, rather surprisingly, consists of Mobile Observation Posts. These remain among the most reliable of the early-warning mechanisms available to the Indian Air Force.[5] The MOPs consists of two-man teams equipped with a HF/VHF radio set and field glasses.[6] The personnel in the MOP are very well versed in the visual identification of aircraft as well as their general direction of flight.[7]

The MOPs are scattered along the borders at random intervals, ranging between 25 and 45 kilometres.[8] The MOPs give the first warning of airborne intrusion, the general direction of the attack and, more often than not, the number of aircraft and their type.[9] The MOPs are assisted in this task by personnel from the Indian police forces and Railway Protection Force who are given some training in aircraft identification.[10] These agencies report via a communications system based on both HF/VHF radio sets as well as telephone lines. A more advanced communications system based on fibre optic cables and satellite communications is also available to assist the MOPs in reporting to the radar picket line.[11]

The radar picket line, which lies about 150km behind the MOPs, consists of a

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[5] S.P.Baranwal, Military Yearbook 1990-1991, p.246

[6] J.Baranwal, SP's Military Yearbook 1992-1993, p.748

[7] ibid p.SS 13

[8] ibid p.749

[9] loc.cit

[10] G.K.Tanham & M. Agmon, The Indian Air Force: Trends & Prospects ( Santa Monica: RAND, 1995), pp.47-48

[11] S.Basu, 'Battle Eyes in the Desert' in the *Hindu Weekly Edition:* 26 August 1995, p.16

number of radar clusters. These comprise three radar stations separated at a distance of the sum of their radii.[12] The equipment issued to these clusters generally comprises one license-made Soviet ST-68/U and two P-18/-19 radars. These are then flanked by two P-12/-15 radars.[13] The ST-68/U acts as the Control and Reporting Centre ( CRC ).

This may have changed somewhat as the ST-68U, which was plagued with some nagging development problems has largely replaced older Soviet-made equipment.[14] Moreover, India has been license producing the French designed TRS-2215D 3-D surveillance radar for a number of years and has derived an indigenously built radar - PSM Mk.2 from it. These have probably supplanted most of the older Soviet-bloc equipment.[15] It should be pointed out, that these radars are all long-range surveillance types with ranges in excess of 300km and good performance against targets flying at all altitudes - even those employing electronic countermeasures (ECM) and anti-radiation missiles.[16] These radar pickets are responsible for giving accurate information on the intruding force to the Air Defence Control Centres ( ADCC ) located behind the radar picket line. The picket line and the ADCC are separated by a first layer of air defence weapons which are the first to engage the intruders.[17]

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[12] J.Baranwal, SP's Military Yearbook 1992-1993, p.SS 13

[13] loc.cit

[14] ibid pp.751-752

[15] B.Blake,Jane's Radar and Electronic Warfare Systems:1995-1996,(Surrey: Jane's Info.Group, 1995),p.17

[16] For a more detailed discussion, see Jane's Radar & E.W. Systems as well as the Indian Air Force section of SP's Military Yearbook 1992-1993, pp.738-758

[17] Baranwal, SP's Military Yearbook 1992-1993, p.749

ADCCs also keep in touch with the Base Air Defence Zone ( BADZ ) control centres. The BADZ is a scaled down version of the ADGES configuration and is geared towards the defence of key air bases and other high value targets. The BADZ is limited to an arc of 100km, compared to the hundreds of kilometres in the case of the ADGES system.

Like the ADGES, the BADZ consists of three layers. The first of which are the mobile observation posts, followed by a mixed layer of weapons and their associated radars along with a picket line of low-level radars. These are in turn supported by anti-aircraft artillery batteries. This network is controlled by a ST-68U radar.[18] The BADZ provides comprehensive and gap-free coverage over its assigned area of responsibility. Some observers have likened the BADZ set-up to the defence pattern of a carrier battle group. Any aircraft attacking a vital military target, therefore, not only has to get past the ADGES, but also the far more formidable BADZ. This has serious implications for the attacking force.

India's air defences currently rely on a mix of MiG-21/-23/-29 and Mirage 2000 interceptors and thirty-eight squadrons of surface-to-air missiles. The SAM units comprise 30 squadrons of SA-3b *Pechoras* and 8 squadrons of SA-8b *OSA-AKM* systems and are deployed to protect key air bases as well as some major military/industrial centres.[19] Though the SAMs are old, they have been updated periodically and, when operating as part of the BADZ, are deployed in such a manner as

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[18] loc.cit.

[19] World Air Power Journal - Volume 12: Spring 1993, p.146

to minimize their shortcomings. It should be pointed out, however, that this system is geared up to the defence of point targets and not for overall area defence. It also lacks a viable capability against ballistic missiles. With this in mind, the Indian Air Force has begun a massive modernization of its strategic air defences.

The first signs that India was modernizing its air defences came when a massive order was placed for Sukhoi SU-30 combat aircraft. These aircraft, the first batch of which has now been delivered, are primarily long range interceptors, capable of intercepting targets at ranges exceeding 120km.[20] When this is added to the fact that India's ongoing MiG-21bis upgrade program is primarily aimed at enhancing the aircraft's air defence capabilities and that AEW aircraft are about to be deployed, it can be seen that India's fighter defences are about to be dramatically enhanced.

Further to these developments, news began leaking out about the deployment from 1998 onwards of an Anti-tactical Ballistic Missile screen.[21] This system is to comprise the Russian S-300V ATBM (SA-12) and India's own 'Akash' missile which has a considerable ATBM capability. In March 1997, the Indian press confirmed these reports, stating that one S-300V squadron was being purchased, with more to be built under license.[22] These would provide a comprehensive defence against ballistic missiles as well as manned aircraft coming in from either Pakistan or China. These ATBMs may not be able to intercept all incoming missiles but they would provide an additional layer

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[20] *The Hindu* - 12 June 1997, p.1

[21] 'Coping with Sky Spies' in the *Hindustan Times* - 18 January 1997

[22] *Deccan Herald* - March 27 1997 On 23 March 1998, the author held discussions with retired Air Marshal 'E' who confirmed existence of the ATBM plan. He refused to be drawn into divulging its current status.

of defence.

As can be seen, these systems will provide India with an extremely potent defence against both Pakistani and Chinese ballistic missiles and manned aircraft carrying nuclear weapons. In the case of Pakistan, the problem is further compounded by the fact that any aircraft attempting to avoid these defences by going over the Arabian Sea, will be detected and engaged by the fighters and SAMs of India's powerful Western Fleet. In fact, if they attempt a low-level penetration run against BARC or Mumbai, which would be a risky venture without external fuel, they would come within range of India's coastal patrol forces which are equipped with 40mm anti-aircraft guns and man-portable SAMs. Would Pakistan risk their aircraft against targets deep in India when the probability of intercept increases the further away from Pakistan the target lies ?

Therefore, India's strategic air defences severely restrict the number and types of targets that would be potentially vulnerable to Pakistani attack. Moreover, when India's air defence modernization is complete, and the Indian government seems to be committed to this, the prospect of any Pakistani aircraft getting through is remote. Ballistic missiles may have a better chance of succeeding, even with an Indian ATBM screen, but their ranges are severely limited. The old adage of nuclear deterrence - 'one will always get through' - is being challenged by massively enhanced Indian defences. This could, in theory at any rate, seriously upset the Pakistani nuclear deterrence strategy.

Strategic Air Defences in Pakistan

Pakistan's Air Defence Command was formed in 1975 - over a decade before India's. It is based at Chaklala air force base near Rawalpindi and exercises control, surveillance and coordination over all Pakistani airspace.[23] The ADC HQ is based in bunkers 5 to 10 metres below ground and has four rows of consoles with 20-25 men operating them. All units - aircraft, airbases and AAA units - are represented on screens. In fact, the ADC HQ set-up is regarded as being one of the most modern in existence.

Subordinate to the ADC HQ are four Sector Operations Centres, which in turn control seven Control & Reporting Centres (CRCs). The four sector headquarters are located at Quetta, Sargodha, Karachi and Peshawar.[24] As in the case of India, Pakistan has a comprehensive radar network which can also accept data from the civilian air traffic control radar. The radar network was established from 1976 onwards as part of Project *Crystal* which aimed to give Pakistan a modern air defence network. Pakistan operates a bewildering variety of radars from varying sources. The most modern units are six TPS-43G 3-D long range radars. These are supplemented by some older American, Chinese and British long range radars.[25]

As regards low-level radars, in 1979-80, as the first stage of Project *Crystal*, Pakistan purchased 45 mobile pulse doppler radars from Siemens of Germany. These systems are of the MPDR 45/E type and are controlled by 6 CRCs.[26] These are

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[23] Rikye, Singh & Steinemann, Fiza'Ya: The Psyche of the Pakistan Air Force, p.95

[24] Loc.cit.

[25] ibid p. 96

[26] loc.cit

extremely capable radars and significantly enhance Pakistan's ability to detect low-level Indian intruders. However, since most of Pakistan's major targets are located so close to the Indian border, there is very little time available for the defenders to react. This problem will remain with Pakistan for the foreseeable future.

Despite this investment in radars, one major gap remains - along the Indian border from Sialkot to Suleimanke where major targets are located.[27] Pakistan had hoped to bridge this gap, and solve a few other low level detection problems with the purchase of E-2C *Hawkeye* AEW aircraft, but this order failed to materialize and Pakistan is unlikely to get an AEW aircraft in the near future.

Pakistan's air defences are centred around three squadrons of F-16A/B aircraft, backed up by large numbers of Chinese F-7s and French Mirage III/Vs. These aircraft, while reasonably effective, are handicapped by a lack of long range air-to-air missiles and, in the case of the F-7, Mirage fleets, the lack of truly modern radars. Pakistan had hoped to obtain up to 40 Mirage 2000-5 aircraft from France, but the deal has not yet materialized, and may have been cancelled outright. Pakistan has now started an update program for its Mirage and F-7 interceptors with the hope of making them more viable in the all-weather intercept role. These will provide Pakistan's air defence assets with a major leap in overall capability and would pose some problems for an Indian attacking force. At the very least, India would have to provide a heavy escort to its strike aircraft.

Pakistan's SAM defences are also peculiarly thin - comprising only 6-8 squadrons of *Crotale* mobile SAMS and 1 squadron of HQ-2Js ( Chinese versions of the

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[27] ibid p.97

SA-2 ).[28] These are backed up by a very large number of flak regiments (up to 43) operated by the air force and the regular army as well as AAA units held by reserve formations. These regiments largely operate Chinese made anti-aircraft guns of calibres ranging from 12.7mm to 37mm. While these provide some defence against aircraft, they are of no use against missiles. What is even more surprising is the lack of Pakistani investment in SAMs. It is possible that this is because of the relatively high running costs of SAM units and the desire to obtain as many manned aircraft as possible. This, of course, has the result that Pakistan has no defence of any kind against Indian ballistic missiles.

Compared to India's array of SAMs and fighters, Pakistan's air defences, while well coordinated, are not very sophisticated. Pakistan is further handicapped by the fact that it cannot yet develop or deploy any defence against ballistic missiles. Neither Russia nor the United States will sell ATBMs to Pakistan and China has only a few batteries of SA-10s. As the Indian Air Forces obtains more and better ECM, the ability of Pakistan's air defences to stop a determined Indian air assault for more than a few days must be questionable at best. If ballistic missiles are brought into the equation, Pakistan's position is even worse. What is even more alarming from the Pakistani point of view is that any Indian nuclear strike would probably be preceeded by a massive effort aimed at destroying the Pakistani air defence network.[29] As India's conventional air doctrine involves heavy effort against Pakistan's air force, after a few days, the

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[28] ibid p.100

[29] Interview with Air Marshal 'E' on 23 March 1998. He indicated that 'surges' of sorties would be made with the sole objective of rendering the Pakistani air defence grid inoperative.

Pakistani air defence network could lose much of its cohesion.[30]

## Implications of Air Defences on Nuclear Strike Patterns

In view of the details of the air defences provided above, what conclusions can be drawn about the nuclear strike options available to India and Pakistan ?

The first thing has to be that the 'sneak attack' scenario of one or two Pakistani F-16s penetrating Indian air defences and bombing New Delhi, while favoured by Indian journalists and alarmist analysts, is complete nonsense.[31] Any nuclear strike by manned aircraft would have to be quite large - perhaps 20+ aircraft. The bombers would have to be protected by escort fighters and electronic countermeasures support aircraft.

Given that Pakistan has only 40 F-16s and that these aircraft form the core of Pakistani air defences, it is highly unlikely that more than a few of them would be spared for each strike. The rest of the aircraft would comprise Mirages and, possibly Chinese made F-7s & A-5s. Moreover, the minute the Indian air defences detect a formation of Pakistani aircraft heading for a major city, they may well view this as a nuclear strike.

India's manned aircraft face a similar problem. Although there are more of them, and Pakistan's air defences are not particularly dense, Pakistani interceptors operating under the excellent direction of the Air Defence Command, may well be able to swamp

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[30] Air Marshal 'E' indicated a period of 10-14 days before the Pakistani grid became completely defunct

[31] The Indian popular press from 1987 has been full of such scenarios. In recent years, however, the press now substitutes Pakistani missiles for the F-16 as the prime delivery system

a small Indian raid by sheer weight of numbers.[32] So any Indian nuclear strike would also have to include 20+ aircraft per strike. In addition, it is possible for India to mount very heavy air defence suppression raids, this would warn Pakistan of a possible nuclear strike.

The only truly effective delivery systems available to either side are their ballistic missiles. While India is developing an ATBM screen, this will not guarantee the interception of all ballistic missiles. Pakistan, on the other hand, has no defences against India's ballistic missiles. This means, however, that targets only within a 300km radius can be realistically attacked. Anything beyond that is very risky for the strike aircraft involved.

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[32] In certain cases it may be possible for Pakistan to put up two or three interceptors for every Indian raider. However, these encounters would be rare.

## The Effects of Nuclear Strikes in South Asia

It is an established fact that a nuclear attack on any South Asian city would bring death and destruction on an unprecedented level. But how bad is the damage likely to be ? What about civil defence measures ? And, what targets are most likely to be attacked ? There is a complicated mathematical formula for working out the blast effects of various nuclear explosions.[33] However, the most important outcome is the realization that the effective blast radius is quite enormous - the radius of the 2 psi ring being between 1.25-2 miles and the area destroyed ranging from 4.9-12.5 miles.[34]

To get a better understanding of the casualties produced by the blast effects, the United States Office of Technology Assessment calculated that the winds associated with as little as 2-3 psi could blow people out of windows.[35] The OTA also suggested that it could be assumed that anyone within the 5psi ring would be killed.[36] Scholar S.Rahid Naim goes further, stating that it is possible to assume that all the people between the 5psi ring and the 2.2psi ring would be injured.[37] These figures are largely extrapolated from the actual effects of the atomic weapons used at Hiroshima and

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[33] K.Sundarji, Blind Men of Hindoostan, pp.222-230 This provides a very simple and extremely clear analysis of the mathematics involved in the calculations. It is vastly more understandable than the work done by S.Rashid Naim in 'Asia's Day After' pp.253-255

[34] S.Glasstone & P.J.Dolan, The Effects of Nuclear Weapons ( Washington D.C.: Department of Defense & Department of Energy, 1977 ), p.544 and on the 'Nuclear Bomb Effects Computer'. A discussion on the varying psi effects is also given.

[35] Office of Technology Assessment, The Effects of Nuclear War, ( Montclair, N.J. : Allanheld, Osmun & Co., 1980 ), pp.18-19 Hereafter, this report will be reffered to as OTA - this is the abbreviation used by both S.Rashid Naim & General Sundarji.

[36] ibid p.19

[37] S.Rashid Naim, 'Aadhi Rat Ke Baad (After Midnight )' in S.P.Cohen ed. Nuclear Proliferation in South Asia- The Prospects for Arms Control, ( Boulder, Colorado: Westview Press, 1991 ), pp.28-29

Nagasaki. Moreover, while these figures are mere estimates, they provide a horrifying glimpse at what could happen.

The assumptions in the OTA report are summarized by General Sundarji:[38]

1) A typical residence will collapse with an overpressure of 5 psi
2) Over 12 psi - 98% dead & 2 % injured
3) 5-12 psi - 50% dead, 40% injured & 10% safe
4) 2-5psi - 5% dead, 45% injured & 50% safe
5) 1-2 psi- 25% injured & 75% safe

Using a further series of mathematical formulae, we can get an estimate of both the killed and injured.[39] For this purpose, General Sundarji used a population density of 15,000 people per sq.km for both India and Pakistan, while S.Rashid Naim has uses a variety of sources.[40] Both give a terrifying glimpse into potential armageddon.

While S.Rashid Naim gives a comprehensive list of targets, populations and casualties, some of his targets are unrealistic as they are either out of the range of Pakistani delivery systems or close enough to the Pakistani border to inflict considerable fallout damage.[41] General Sundarji, however, has provided a much more realistic scenario - using Sundarji's targets and S.Rashid Naim's analysis a very interesting picture emerges.

Sundarji assumes an attack on Delhi with 4*x* 20kT atomic weapons - low air bursts delivered by aircraft; an attack on Mumbai with 2*x* 20kT weapons - low air bursts delivered by surface ship launched missiles ( not as yet a Pakistani option ) and three

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[38] General K.Sundarji, Blind Men of Hindoostan, p.224

[39] ibid pp.228-230

[40] ibid p.230 and S.Rashid Naim, 'Asia's Day After', pp.271-272

[41] loc.cit.

tactical targets attacked with 1*x* 20kT each (these were not used in the casualty analysis and were assumed to have suffered relatively modest casualties).[42] Sundarji's assumption is that a nuclear attack on a mechanised infantry or armoured formation would not be catastrophic.

In retaliation, Sundarji assumed that India had 20*x* 20kT weapons earmarked for use against Pakistan - after leaving aside a reserve for use against China. India retaliated by attacking Islamabad-Rawalpindi with 5*x* 20kT atomic low air bursts and Lahore with 3*x* 20kT low air bursts.[43] It should be stated at the outset that Islamabad and Rawalpindi are very close geographically and Lahore is the heart of the Muslim Punjabis that dominate Pakistan's political and military establishments. S.Rahid Naim does not give separate figures for Islamabad, so the population he gives for Rawalpindi was used instead. His figures are only for a single 20kT weapon hitting each target, so some modifications are needed, highly inaccurate in this example, but still a better estimate for casualties.

The estimated casualties, using first S.Rashid Naim's estimates and then General Sundarji's are approximately as follows:

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[42] Sundarji, Blind Men of Hindoostan, p.136

[43] ibid p.139

India:

| Target | Population | Deaths | Injuries |
|---|---|---|---|
| Mumbai | 11,914,900 | 136,900 *x*2 | 224,600 *x*2 |
| Delhi | 9,118,600 | 40,700 *x*4 | 66,900 *x*4 |

Source: S.Rashid Naim, 'Asia's Day After' p.272 Figures here are for a single 20kT strike. Multiplying by the number of weapons used gives an inaccurate, but somewhat better idea of the casualties.

Pakistan:

| Target | Population | Deaths | Injuries |
|---|---|---|---|
| Islamabad/ Rawalpindi | 1,427,100 | 68,300 *x*5 | 11,200 *x*5 |
| Lahore | 4,599,900 | 66,100 *x*3 | 10,800 *x*3 |

Source: S.Rashid Naim, 'Asia's Day After' p.271. Again multiplying the figures by the number of weapons used provides a more appropriate, but very inaccurate estimate.

General Sundarji arrives at rather different figures - he does not give a city breakdown, but rather summarizes the casualties as follows:[44]

| | Killed | Wounded | Total |
|---|---|---|---|
| India | 1,025,800 | 2,078,700 | 3,104,500 |
| Pakistan | 1,360,940 | 2,760,000 | 4,120,940 |

Sundarji goes even further, stating that if India had used all 20 weapons earmarked for use against Pakistan in its retaliatory strike, Pakistan would have suffered over three million dead and close to seven million injured.[45]

Of these figures, Sundarji's produce the higher estimate of casualties ( and

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[44] loc.cit.

[45] loc.cit.

probably the more accurate ). In addition, his estimate of six Pakistani weapons actually reaching and striking their targets is perhaps a fair assessment of the number of weapons that might actually penetrate Indian defences today. Whether they will be able to survive once India's air defence modernization is complete is open to question.

It will be noticed that both Sundarji and Rashid Naim have assumed a case where no civil defence measures of any kind were taken to provide even a veneer of protection to the civil population. It is well known that in both India and Pakistan fire-fighting and medical services are very limited indeed and this has led to the assumption that neither country has either plans nor any structure to cope with any nuclear catastrophe. In the case of India, at any rate, this may not be entirely accurate.

If there is any warning prior to war - a few days or a week - India has the ability to field a potentially huge civil defence force operating to a plan - a fairly old and unpractised plan - of some kind. It is extremely important that the civil defence structure be examined in some detail. Too many analysts overlook the Indian civil defence structure completely. However, as will be shown, the sheer number of personnel available with even a modicum of civil defence training has the potential to make some difference.

Civil Defence in India:

On 19 June 1997, a very strange meeting took place. The eleventh Conference of Directors of Civil Defence and Home Guards took place over two days; the first such meeting in eight years. Of the 32 items under discussion, the threat of NBC weapons

was placed first on the agenda.[46] This indicates, at the very least a revival of this issue within the Civil Defence Structure. Up until the mid-1980s all civil defence measures remained primarily concerned with conventional attacks and the civil defence volunteers were trained to cope with air raids. However, in 1985, the set-up was altered and a new category of towns - Category 1(A) - was created. These towns were those considered to be most at risk from nuclear threats.

There is a major factor that will affect the efficacy of the Indian civil defence structure - warning time. There is a huge difference between an attack in the middle of a war and a surprise attack. In the former case, a major mobilization of all assets would have already been completed and some basic civil defence measures, such as limited evacuation and shelter construction, undertaken. In the latter case an even more chaotic situation would occur. It is extremely difficult to assess the capability of the Indian civil defence structure in the event of the nuclear attack, however, the sheer number of personnel available makes the discussion of the issue essential.

As part of the post-1962 massive rethinking and reorganization of India's national security policy, the British civil defence expert, General Irwin, was invited to draft the blueprint of a national civil defence plan and to give practical advice on how to meet both conventional and unconventional attacks.[47] Two manuals were compiled and circulated to all state governments for the preparation of comprehensive civil defence plans in selected high priority towns which were categorized on the basis of their

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[46] A. Talwar, 'States asked to give thought to nuclear threat', *Indian Express*: June 28 1997

[47] R.Prasad, India's Civil Defence in the Nuclear Age ( Bareilly: Prakash Book Depot, 1988 ), pp.63-64

importance.

The Defence of India Act 1962 gave the State and Union Territory governments with all the powers necessary for the implementation of the measures outlined in General Irwin's manuals. These two manuals - ' The Master Plan for Civil Defence in India' and 'General Principles of Civil Defence' - form the structural basis for India's Civil Defence Organization to the present day.[48]

As regards the implementation of these plans, it was officially stated in the Indian Parliament in 1963, that while certain recommendations were implemented immediately, other measures regarding civil defence were to be kept on paper, to be implemented when needed. To this end, a comprehensive plan of operation was drawn up and directives issued to the State and Union Territory governments to make their own civil defence plans and to keep them, even if just on paper, in a state of readiness for their successful implementation in an emergency.[49]

In 1995, the Indian Civil Defence Organization had a sanctioned strength of 676,000 volunteers in addition to a small ( strength unknown ) nucleus of professional staff which is to be augmented in an emergency.[50] However, only 376,000 have actually been raised and of these, only 330,000 are fully trained.[51] The civil defence staff and

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[48] ibid p.64

[49] Loc.cit Also, 27 March 1998 interview with Major General 'H' - former Director General of Civil Defence. The author was informed that the plans seek to make optimum use of existing assets, including drawing safety and protective equipment as well as personnel from the civil chemical industries as needed.

[50] Government of India, India 1995 - A Reference Annual, ( New Delhi: Ministry of Information & Broadcasting, 1996 ), p.685

[51] Loc.cit. The fact that the Indian Government publishes these three figures and is fairly honest about the numerical strength of the Civil Defence Organization may be an indication that the Government is fully aware of the strengths and weaknesses of the existing structure and is working to remedy them, but is not having much

volunteers are a distinct and separately organized group from the other Indian emergency services - i.e. fire departments and paramedics.

At present, civil defence units are raised and stationed in categorized civil defence towns. These towns are graded on both their vulnerability and on their strategic importance - a practice dating back to the Second World War. At present, there are 110 categorized towns spread over 24 states and union territories.[52] This means that civil defence personnel and expenditure are concentrated in the areas where they are needed most. This is particularly important since the regular civil defence forces receive only Rs. 65 million from the central government.[53] The Central Government handles all matters regarding equipment and communications. All the central government ministries have civil defence cells which would be activated in wartime.[54]

In addition to these volunteers, the Indian Civil Defence Organization relies heavily on the Home Guards and the National Cadet Corps. These two organizations are funded and, in the case of the NCC, trained separately from the civil defence volunteers.

The Home Guards have a sanctioned strength of 573,793 and has a current raised strength of 418,493.[55] Unlike the Civil Defence Organization, the Home Guards are spread across the country and extend into the rural as well as the urban areas. The Home Guards were created as an auxiliary to India's vast police and paramilitary forces

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[52] Government of India, India 1995 - A Reference Annual, p.685

[53] Loc.cit

[54] R. Datta, Civil Defence - Problems & Prospects, ( New Delhi: Shegal Publishers, 1991 ), p.13

[55] Government of India, India 1995 ,p.685

and have an important role in the maintenance of law and order as well as internal security.[56] In peacetime, the Home Guards assist communities in emergencies as epidemics, fires and floods, while their role in wartime extends to civil defence work as well as assisting the army in maintaining rear area security.[57]

The Home Guards have a budget of Rs.280 million which is considerably higher than the Civil Defence Organization budget.[58] The organization, since it is more geographically widespread, provides a veneer of civil defence cover to rural areas as well as reinforcing the civil defence units in the 110 categorized civil defence towns. Their training prepares them for rescue and fire-fighting work. In fact, the Home Guards, along with personnel from the police and paramilitary forces are expected to provide the trained personnel needed for the enlarged rescue and fire-fighting services needed by civil defence units. The National Cadet Corps are another important source of manpower for civil defence.

Since the 1980s, 32 NCC officers and cadets are trained as civil defence instructors at the National Civil Defence College each year.[59] The National Cadet Corps Act of 1948 states that NCC cadets have no military service liability.[60] This means that they cannot be deployed on duties where they have to be armed unless special

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[56] Loc.cit.

[57] Lt.Gen. M.L.Chibber, Paramilitary Forces - USI Paper 4, ( New Delhi: United Services Institution, 1979 ) , p.10

[58] Government of India, India 1995, p.685

[59] Government of India, Ministry of Defence Annual Report 1995-1996, p.88

[60] S.P.Baranwal, Military Yearbook 1974, ( New Delhi: Guide Publications, 1974 ), p.223

legislation is passed. This, however, does not exempt them from civil defence work.

On 9th. September 1965 - during the 1965 India-Pakistan war - the Indian Central Government drew up a list of duties which were to be performed by NCC personnel over the age of 17. [61] These included passive air defence - rescue operations, first aid and casualty evacuation as well as the operation of evacuation camps.[62] The NCC cadets are also given training in fire-fighting and some instruction in specialized rescue operations. With even the limited training imparted to the cadets, the NCC forms a very useful reinforcement for the Civil Defence Organization. This is even more obvious when it is realised that the NCC has 420,000 cadets in its Senior Division, which is made up of university students over the age of 17.[63] The central and state governments contribute to the expenditure on the NCC in the ratio of 2:1.[64]

In addition to these organizations, the Indian government controls the Central Industrial Security Force and the Crisis Management Group of the Atomic Energy Regulatory Board. These two organizations, while not specifically created for the task of civil defence, could provide vital equipment, training and skilled personnel when operating in an environment of either radioactive or chemical contamination.

As regards funding, the Indian central government maintains a sizeable calamity relief fund for use in the case of a natural disaster. This would provide a valuable source of reconstruction funds for post-war recovery. In fact, it can be said that the published

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[61] Loc.cit.

[62] Loc.cit

[63] J.Baranwal, The Military Yearbook 1992-1993, ( New Delhi: Guide Publications, 1993 ), p.801

[64] J.Baranwal, The Military Yearbook 1993-1994 ( New Delhi: Guide Publications, 1994 ), p.366

expenditure on civil defence - Rs. 65 million - represents a relatively small fraction of the expenditure on a disaster relief/civil defence infrastructure. While little evidence of civil defence activities can be seen in peacetime, the extensive pool of manpower, combined with plans and an organizational set up, gives India to field a civil defence organization in wartime that is far better organized, larger and more capable than would first be apparent from the rather pathetic peacetime infrastructure.

A reliable and flexible early warning network based on both telephone lines and on radio and wireless has been established in categorized civil defence towns.[65] Most states have communications networks for use in the event of a natural disaster - cyclones and floods in particular. The Indian Department of Telecommunications would be responsible for most emergency broadcasts. Agencies like All India Radio will play an essential role in any civil defence situation in the Indian context.

As far as the individual states are concerned, there is a nucleus of civil defence instructors and experts under the control of the state police and fire services. These have in the past been used for rescue operations beyond the ability of the regular emergency services.[66] They are apparently well trained and reasonably well equipped - including protective masks and clothing for chemical attacks/disasters.[67] It is not clear, however, as to how many personnel are available for immediate use nor are any clear details available about their organization - it is unlikely to be above company/battalion strength.

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[65] Govt. of India, India 1995, p.685

[66] *The Asian Age* - 5 July 1995, p.5 A team of civil defence experts from Rajasthan were involved in a rescue operation to free some villagers trapped in a well after being overpowered by poison gas.

[67] Loc.cit.

The regular fire-fighting services, though poorly funded, are generally quite capable and have reasonably modern equipment - at least in the major cities.

As far as air-raid shelters are concerned, the Indian Civil Defence Act of 1968, makes provision for any Indian police officer or civil defence official to order the construction of an air raid shelter wherever and whenever necessary.[68] The Crisis Management Group of the Atomic Energy Regulatory Board constructed a number of shelters for use in the event of a nuclear accident , designed to be blast and fallout proofed.[69] All military installations have underground command centres and major fuel and ammunition stores at airbases are buried deep underground.[70] The Indian civil defence plans place great emphasis on the construction of emergency air raid shelters. Particular emphasis is given to trench shelters - both covered and uncovered. While these would provide very little protection against blast effects, the trench shelter offers very considerable protection against the effects of nuclear fallout and radiation.

All states have evacuation plans of some kind and some have become quite adept at emergency evacuation of even extremely remote areas. The government of the impoverished state of Andhra Pradesh, for example, was able to evacuate over 260,000 people over the course of a few days in November 1996.[71] This was done to avoid a sudden cyclone - much more could be expected to be done with adequate warning and from urban centres well served with road and rail links- like the various state capitals,

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[68] *Civil Defence Act 1968* - Section 18

[69] *South* - June 1989 p.15

[70] Maj. S. Bhaduri, 'Weapons Overview' in *Indian Defence Review: July 1991*, p.168

[71] G.Radhakrishna, 'Once is not enough' in *Sunday* - 15-21 Dec.1996, p.29

though the huge populations of the major cities would present a daunting task.

As regards equipment, the Public Works Departments possess almost all equipment necessary for rescue work. The fire departments are usually equipped to a reasonable standard - including aluminized fabric garments and breathing apparatus, which protect against NBC agents to a considerable extent.[72] The auxiliary fire fighting, rescue and emergency units would be provided with protective gear as and if required.

Paper plans to cope with emergencies abound in India - though they are not publicized. However, the moves by the Indian government to create a comprehensive disaster management plan must be viewed positively, even if much of the infrastructure is not in place. This policy, drawn up in consultation with the state governments as well as central ministries and institutions, lays out a comprehensive set of guidelines for dealing with natural calamities, civil strife as well as chemical and nuclear disasters.[73]

A crisis management plan has already been implemented for dealing with chemical emergencies at the central, state and district levels.[74] Guidelines have already been sent to the states and the central government is providing assistance for the development of the required infrastructure.[75] While this may seem to be of little relevance, the coordination of skilled personnel now being trained and equipped under this scheme would be invaluable in the event of a chemical attack - as would the protective equipment needed.

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[72] Personal communication with Dr. T - dated 29 January 1995

[73] 'Centre drafts disaster management policy' in *The Asian Age* - December 29 1994

[74] Govt. of India, India 1995, p.186

[75] Loc.cit.

Of even greater importance are the emergency plans of the Crisis Management Group of the Atomic Energy Regulatory Board. In addition to the provision of shelters mentioned earlier, the CMG has organized a central stockpile of protective clothing and monitoring equipment which could be airlifted to the scene of an emergency.[76] The CMG has also trained medical and relief workers in the areas around nuclear power plants on how to deal with a nuclear disaster.[77]

The Category 1(A) civil defence towns, of which there are now 13, have civil defence plans to cope with the threat of an accident from nuclear power plants. The plans concentrated on minimizing the effect of nuclear fall-out through affordable methods. The Home Ministry also believed these plans to have some capability to deal with a nuclear attack.[78] These plans, however, need updating and it appears that while contingency plans exist, no truly comprehensive policy exists to cope with a nuclear attack. This may be changing, at recently held conference, the Civil Defence Directorate urged all states to work out plans to cope with nuclear attacks. In fact, the conference seemed to suggest that the whole civil defence set-up be reconfigured to cope with NBC attack. How far these plans have progressed is unknown, but it is clear that plans and a nucleus of trained personnel exists.

What is striking about the Indian civil defence plans is their reliance on the Home Guards, police and NCC to provide manpower for the emergency units. The

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[76] *South* - June 1989, p.15

[77] Loc.cit.

[78] A.Talwar, 'States asked to give thought to nuclear threat'

problems with this scheme are twofold: how well trained are these units and how fast can they be mobilized ?

Elements of the National Cadet Corps do receive training in civil defence - instructors at the National Civil Defence College and others at annual training camps.[79] The NCC has, during the 1965 and 1971 wars, been used for civil defence duties. In 1971, over 100,000 cadets volunteered for civil defence duties.[80] The performance of the NCC units in both wars was considered reasonably good and they earned considerable praise.[81] It is not known how well they would perform, but their previous performance gives cause for some optimism. With regard to the Home Guard units, they have, even in peacetime, been used to augment both the police and regular fire brigades. Their performance in any future war would depend on how much time was available for refresher training in new civil defence techniques. Not much time may be available - at least a week would be needed.

The mobilization of the manpower for civil defence tasks could well be a very time consuming task. Home Guards are raised in their specific towns and are therefore available at relatively short notice. However, it is not clear whether their equipment would be available as easily, nor is it clear that this equipment would be in a good state of repair. Nonetheless, at least some equipment - especially the fire-fighting and rescue apparatus - is kept to a very high standard as it is often needed by the regular fire-

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[79] S.C.Maikap, Cadet Corps in India, ( Calcutta: Darbari Udjog, 1979 ), p.117

[80] ibid pp.163-165

[81] Brig.M.M.Sharma, The National Cadet Corps of India, ( New Delhi: Vision, 1980 ), pp.161-163

fighting services and the public works departments. The NCC units are based at colleges and universities and as such may be easily mobilized. Additional manpower is available from the State Armed Police Battalions, which are usually available at short notice and have a fair amount of expertise in rescue work during natural disasters.

Perhaps the biggest hurdle faced by the Indian Civil Defence Organization is public apathy in peacetime. It is extremely difficult to motivate people and governments to allocate either time or money for civil defence tasks. This is why there is a shortfall of 300,000 personnel in the strength of civil defence volunteers.[82] Indian state government, while receiving adequate funding from the central government, tend to cut back on the state's contribution to civil defence units.In the case of the corrupt and impoverished state of Bihar a state of utter chaos exists in the state civil defence department.[83]

In peacetime, the police officers assigned to civil defence departments are usually officers who are anti-corruption or who have the courage to stand up to illegal orders.[84] These officers, while reasonably competent, feel frustrated as they are considered to be out of favour with the police high command. In some states, however, these police officers are also in command of the regular fire-fighting units. Here, as in the case of civil defence, inadequate funds are provided, though, with help from Japan and from the Government Insurance Corporation of India, additional funds for the modernization and expansion of state fire services have been recently been forthcoming.[85]

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[82] Prasad, India's Civil Defence in the Nuclear Age, p.64

[83] *The Statesman Weekly Edition* - October 23 1993

[84] Datta, Civil Defence - Problems & Prospects, p.44

[85] Govt. of India, India 1995, p.687 See also SP's Military Yearbook 1992-93, p.809

Public apathy is far more difficult to overcome. As soon as an air-raid materializes, there is a clamour for civil defence measures, yet, the public have not taken and do not take civil defence seriously, until war breaks out.[86] It is virtually impossible for the police officers, Home Guards and fire service personnel to encourage the population to take civil defence more seriously in peacetime - it is almost impossible to get Indian civilians to take peacetime fire prevention regulations seriously.

The other problems faced by civil emergency units in India are extremely serious. There is a lack of coordination among various agencies and many lack adequate preparation for their assigned tasks.[87] In addition there is a lack of centralised ambulance, accident and trauma services.[88] These make relief operations in peacetime extremely difficult, but India copes effectively with several natural calamities each year. The civil defence plans provide for rectifying many of these weaknesses in times of war by mobilizing auxiliary units, but it remains to be seen if this will work effectively. Nuclear war is a very different proposition to either a natural disaster or conventional air raids.

It will be noticed that this discussion has exclusively focussed on the Indian civil defence structure. A few - and it must be stressed a very few - good books are available on India's civil defence establishment.[89] However, these are not available for Pakistan.

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[86] P.V.R.Rao, Defence Without Drift, ( Bombay: Popular Prakashan, 1970 ), pp.282-286

[87] K.M.Mathur, Management of Internal Security, ( New Delhi: Gyan Publ., 1995 ), pp.166-167

[88] ibid p.169

[89] The best being Dr. R.Prasad India's Civil Defence in the Nuclear Age which has been used extensively in this chapter.

Pakistan faces identical problems to India but with the additional problem of the very limited land area available for evacuation and on the smaller number of trained personnel available for civil defence tasks. In addition, medical facilities in smaller Pakistani cities are substantially inferior to those in some of the less important Indian cities so the loss of hospitals and medical personnel will be more acutely felt.

Nonetheless, no matter how quickly either country can prepare their civil defence units, it is unlikely that the enormous casualties involved in a nuclear attack will be avoided completely, even with large scale evacuations. The sad truth is that no civil defence plan can adequately protect a city from a nuclear strike and the millions of casualties predicted by both Sundarji and Rashid Naim will probably occur. The casualties would only be the start of the post-attack problems. Depending upon the size of weapons used and whether air or ground bursts are used, there could be colossal environmental consequences and severe economic repercussions.

The only consolation for India is that the bulk of the vital war industries - and most of the civilian industries - lie far away from the most likely targets of a Pakistani nuclear strike. This is not the case in Pakistan where the lack of geographical depth prevents the dispersal of key industrial sites. This truth of geography also leads to another fact - India has the potential to recover more successfully and more completely from a nuclear strike than Pakistan. As of now the Pakistani High Command has to face an unpleasant truth - India would be severely battered by a nuclear strike but Pakistan will be almost completely obliterated.

## The Uneasy Stalemate - What is preventing War ?

As the Kashmir dispute spirals downwards, there seem to be no signs of India and Pakistan being able to resolve the dispute amicably. Several attempts at talks regarding the issue have been checkmated because of each side's unwillingness to move from their long established positions. At the same time, neither side seems to be moving towards an offensive posture and war seems does not seem to be an immediate possibility. There is a continuing modernization and a small expansion of conventional armed forces, but no move to war. So what is keeping this uneasy peace ? Is it the fear of nuclear weapons or is it something else ?

### Is Nuclear Deterrence Preventing War ?

In an earlier chapter it was pointed out that Indian military strategy in the mid-1980s revolved around major mechanized formations being able to bisect Pakistan, capturing as much territory as possible and forcing Pakistan to captitulate. The nuclear factor changed all this quite dramatically.

India has to believe that Pakistan can, and will, use nuclear weapons to prevent its disintegration. This, it can be argued is what is responsible for India not taking military action even as Pakistani support for Kashmiri separatist groups increases and as the violence in Kashmir continues unabated. India, it can be argued, fears that if it defeats the Pakistani armed forces and is poised to capture substantial chunks of Pakistani territory, Pakistan will go nuclear. This argument can be extended to speculate

that it is this tentative nuclear deterrence is responsible for the current lack of full-scale war.

This may not be entirely correct. As shown previously, India has altered its strategy. No longer does it envisage a war aimed at territorial gain but a much more limited campaign aimed solely at inflicting maximum attrition on the Pakistani military. These objectives were the basis for the war scenario outlined in a previous chapter. It was shown that Indian forces would limit their advance in the Punjab, Gujarat and Rajasthan sectors while concentrating troops in an offensive along the Line of Control.

Both countries are fully aware of the scale of the destruction that would result should the nuclear threshold be crossed and as such neither country is keen to unleash armageddon upon the subcontinent. It has been shown that nuclear weapons have very limited tactical utility in the India-Pakistan context and that the sprawling urban centres of India and Pakistan present prime targets for nuclear strikes. Neither side can take the risk that a limited use of nuclear weapons to halt an enemy advance would not be answered with an unlimited strike on civilian targets. As such, it is extremely unlikely that Pakistan would use nuclear weapons unless its very existence was threatened.

The introduction of nuclear weapons into the South Asian military equation has had the effect of limiting the scope of conventional war. However, is nuclear deterrence responsible for the state of 'no-war' currently in place ?

It has been shown that current Indian military plans will significantly reduce the risk of Pakistani first-use of nuclear weapons, yet war does not seem likely, and this is in spite of what may be considered to be a 'proxy' war being waged by Pakistan against

India. Neither side is keen to initiate conventional military action against the other, despite provovation. One reason for this lies in a deliberate political decision taken by India - partly inspired by the nuclear factor, another is the basic parity that exists at the operational level between India and Pakistan.

The Deterrence of Operational Parity:

India does hold numerically superior and more sophisticated forces than Pakistan and is blessed with a reasonably advanced defence industrial base. However, in a short war lasting two to four weeks, it would be extremely difficult for India to bring the full weight of its forces to bear. While most of the Indian air force could rapidly be transfered to the Pakistan border, the Indian army would be very reluctant to withdraw anything more than a few divisions from the Chinese frontier. At the operational level, both sides are matched in a war of limited duration.

The operational level of war is at the level of an Army Regional command. This is where strategic aims are translated into a workable plan for war-fighting within a particular theatre and military assets are provided commensurate with these plans. The operational level is where tactical battles in a particular area are given a coherent design and are tackled as part of a wider strategic objective.[85]

Operational parity takes several things into account. The numbers of troops and

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[85] The author is extremely grateful to Mr. 'C' for clarifying this issue in a series of discussions in March 1996. This holds true for the Indian Army. Pakistan's General headquarters performs the dual task of strategic planning and operational directive control.

Until the early 1990s, the Operational level in the Indian army was pegged at Corps level which is the minimum level at which joint service operations are undertaken.

the quantity of equipment are only part of this calculation. Training, doctrine and the all important issue of surprise are all critical factors in determining the parity at the operational level in the India-Pakistan context. To understand the concept of the deterrence of operational parity, it is useful to examine the factors listed above, starting with the all important issue of surprise.

As stated before, both India and Pakistan would find it politically unacceptable to lose any major territory in either Punjab or Jammu and Kashmir. To this end, vast Holding Corps are deployed in a purely defensive role.[86] This is combined with a network of extremely formidable defensive fortifications in Punjab and southern Jammu and Kashmir that would slow any advance until at least threatre and possibly even Army reserves can be brought into the field.[87] For at least the first forty-eight hours an offensive would be delayed by the troops manning the linear defences. This is ample time for reinforcement. These linear defences remove the factor of surprise from the equation. Surprise would be difficult, if not impossible to achieve and, in the unlikely event that it was achieved, the linear defences virtually negate any advantage that might possibly be accrued.

With regards to training and doctrine, both sides seem to be more or less evenly matched. Both armed forces have configured their doctrines to take into their respective limitations of time, space and finance. Moreover, as far as training is concerned, despite

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[86] For a more complete discussion on the roles, functions and theatres of war, please examine chapter four in which this is detailed.

[87] The author was informed by Mr.'C' that the defensive fortifications have been extended into North/Central Rajasthan

the fact that division and corps level exercises are relatively rare in the case of the Indian army, the standard of training of the personnel is high on both sides.[88] Similarly, the two air forces possess a correspondingly high standard of training.[89]

This brings us to the issue of numerical strength of manpower and equipment. Here again the two sides are pretty evenly matched. India does have more troops and more ( and in some cases, better ) equipment, but this is not overwhelming by any means. As discussed earlier, the strengths of artillery and armour in the two armies do not give a major advantage to either side. Moreover, since Pakistan raised its third armoured division, the two sides now have parity in terms of massed armoured formations.[90] India may have an edge in numbers of tanks and in armoured regiments, but not in dedicated armoured divisions.

Pakistan's desire to maintain a certain numerical equality between itself and India can be extended to cover the issue of ballistic missiles. India's acquisition of the 'Prithvi' was matched by Pakistan's purchase of M-11/Haft-2s. In addition, India's indigenous production base for 'Prithvi' was matched by a technology transfer to Pakistan from China of the M-11 missile.[91]

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[88] The Indian army is in two minds about the utility of big exercises. Some believe they are absolutely essential, others believe that these exercises simply highlight coordination problems and have little military utility. This was highlighted in Bajpai, Chari, Cheema, Cohen & Ganguly, Brasstacks and Beyond, p.24 A much more detailed account was found in IDR Research Team, 'The Big Exercise Syndrome' in Lt.Gen. M.Thomas ed. *Indian Defence Review:* June 1990, pp.146-156

[89] Both air forces base their training on NATO standards. The Indian press was full of rumours of severe restrictions in flying hours in the IAF. However, a 23 March 1998 personnal interview with retired Air Marshal 'E' revealed that the IAF has had no major problems in flying 15-20 hours per month which is the NATO standard.

[90] India at one stage massed three armoured divisions against Pakistan's two.

[91] See Chapter Three - section on Pakistan's missiles. It is not clear if the factory has actually started producing missiles or not. However, given Pakistan's bugetary constraints, it is hardly likely that large scale production will occur.

The one area where Pakistan may be in danger of losing its operational parity is in the case of air power. Pakistan's air force,though much smaller than its Indian counterpart, has sought to build up sufficient forces to deny India clear air superiority and to mount sustained strike operations against Indian ground formations. However, since the embargo of F-16s to the Pakistani air force, and its subsequent failure to find a replacement, there is a distinct possibility of India achieving a convincing qualitative as well as a quantitative superiority over its Pakistani counterpart.[92] This may well give India a means of breaking the current stalemate in terms of operational parity in the future.[93]

At present, this situation of operational parity between conventional military forces favours Pakistan. As long as Pakistan believes that it has achieved this operational parity, then it will continue to support subversive activity in Indian Kashmir. India, therefore will seek to break this impasse by modernizing its own forces and reorienting its operational doctrines. Conversely, Pakistan will make all efforts to ensure that this operational parity continues. The net result is that there is no war.

Nuclear weapons play a marginal role in this state of no war and no peace. The effect that the introduction of nuclear weapons has had is that the Indian army has had to reorient its battle plans and to limit its advances in Punjab and Sindh. In other words, nuclear weapons have served to limit the scope of an India-Pakistan war, but saying that

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[92] The Indian Air Force has now formulated its first air power doctrine. For a discussion of this refer to P.Sawhney, 'India's first Air Power Doctrine takes shape', *International Defence Review:* June 1997,pp.33-38 Also from personnal discussions between the author and Mr.'C' in May-June 1997.

[93] Whether this happens depends of course on if current modernization plans continue and on Pakistan's inability to match India in terms of aircraft quality in the future.

they are responsible for preventing war from taking place may be an exaggeration .

Perhaps the real deterrent to war, as has been argued above, lies in the current operational parity in conventional forces. Should this operational parity be upset, then the chances of war will increase. This is not to say that war will be inevitable or immediate, but should operational parity be upset in the future, then war may seem to be a more attractive option to the side with the advantage. It is with this in mind that conventional as well as non-conventional arms acquisitions in South Asia must be examined since war is being prevented by a tenuous balance of power between India and Pakistan.

## *Chapter Six:* The Political Implications of a Nuclear South Asia

The technical constraints to a nuclear armed India and Pakistan have largely been overcome. However, should India and/or Pakistan overtly deploy nuclear weapons, the implications for the relationship of these two countries with the international community will permanently be altered. There are very strong domestic pressures in both countries arguing in favour of overt nuclearization and, as will be shown later, these pressures cannot be ignored. Moreover, there is an alternative argument that seems to point to overt nuclearization by both India and Pakistan would lead to a stable deterrent system being established.

The United States is an important player in the region. Both India and Pakistan depend on trade with the United States and both would suffer enormously in the event of American sanctions. By virtue of its large economy and trade with India and Pakistan, and with its global clout, the Americans are potentially very influential. However, the United States has limits to its influence. It has lost a considerable degree of its credibility in South Asia and its rhetoric and mandatory sanctions may be counter-productive.[1]

Neither India nor Pakistan can test a nuclear weapon without invoking the wrath of the United States. According to United States law, under the Glenn Ammendment of 1994, should any country outside the five declared nuclear powers test a nuclear weapon, sanctions would be imposed and World Bank and International Monetary Fund

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[1] See Chapter 1 pp.41-45

loans vetoed.[2] This would be economically and politically disastrous for Pakistan and would be almost as bad for India. While either country would readily defy the United States should they be overtly physically threatened with nuclear weapons or if their strategic threat assessments were to undergo a major change, neither would want to risk sanctions simply for local political prestige without extreme provocation.

Should either India or Pakistan overtly declare their nuclear weapons status, the entire effort against the proliferation of nuclear weapons will suffer a heavy blow. So long as neither country states that it actually has nuclear weapons, the international system can delude itself into thinking that the non-proliferation campaign in South Asia has credibility. However, neither country needs to test a nuclear weapon in order to field a fully operational and viable nuclear arsenal.[3] This is significant since sanctions would not be automatically triggered should either country simply declare itself to be a nuclear power - no matter how much that upsets the Americans.

Moreover, while the current position non-declaration of nuclear weapons possession may be pleasing for the United States and its allies, allowing them to strongly advocate nuclear non-proliferation, it does little for stability in South Asia. Since neither country admits to having nuclear weapons, they cannot sit down and open a constructive dialogue to avoid a potential nuclear conflict. Any discussions between the two South Asian rivals that are now held are held behind the facade of non-

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[2] *The Economist:*February 7th-13th 1998, p.82 The Ammendment also demands that the United States cut-off all non-humanitarian aid to countries testing nuclear weapons and to sever military ties.

[3] This was discussed in some detail in the chapters dealing with Indian & Pakistani nuclear capabilities and delivery systems.

possession of nuclear weapons and therefore cannot be entirely sincere or honest.[4] There is a lack of transparency regarding nuclear issues that does nothing to build confidence between the India and Pakistan.

What about domestic politics ? How popular is the nuclear option among the public in India and Pakistan ? Unlike in the West, where there is a growing sentiment against nuclear weapons, the consensus in both India and Pakistan is decidedly in favour of retaining the capability to produce nuclear weapons, if not so heavily in favour of outright deployment. In what was a landmark study of public opinion, the Marketing and Research Group Pvt. Ltd. of New Delhi was commissioned to survey the opinions of the educated elites found in major Indian cities.

The results of this survey, which was conducted between late September and early November 1994, were published in February 1995, and showed that fifty-seven percent of all respondents were in favour of the current policy of neither confirming nor denying a de facto nuclear capability while thirty-three percent were in favour of an open declaration of nuclear weapons status. A mere eight percent were in favour of renouncing nuclear weapons. This means that a staggering ninety percent of respondents were against India renouncing the nuclear option.[5] If this survey is accurate - and there is no reason to suggest otherwise as yet - then the 'pro-bomb' lobby in India has a good deal of support.

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[4] In light of this inability to be honest with each other, it is not altogether surprising that Confidence Building Measures in South Asia have failed more often than not.

[5] D.Cortright & A.Mattoo, 'Indian Public Opinion and Nuclear Weapons Policy', Cortright & Mattoo, India and the Bomb,p.11

In December 1995, another survey, by the same company was carried out, this time on a cross section of the socio-economic groups found in urban India. An impressive sixty-two percent were in favour of conducting a nuclear test and of those, fifty-four percent were in favour of an Indian bomb test, even if the United States and Japan imposed sanctions.[6]

Politically, therefore, it is virtually impossible for an Indian political party to renounce nuclear weapons, and this leads to the remarkable consensus on the need for a strong nuclear weapons capability amongst India's many political parties.[7] Moreover, in the December 1995 survey, forty-three percent of all respondents said that they would be more inclined to support a political party that would ensure that India had nuclear weapons.[8]

Therefore, it is quite clear that the Indian public believes firmly in the need for a nuclear weapons capability and is against any renunciation of this option. Should India conduct a nuclear test and sanctions are imposed, India will be severely affected but, there may be a willingness on the part of the Indian public to tough it out.[9] There is no similar survey in Pakistan, however, it is very reasonable to assume that there is

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[6] *India Today*: Dec.11 1995, pp.48-49 It will be noted at around this time that a report in the United States claimed that India was preparing to conduct a nuclear test.

[7] There is a similar consensus on India's not signing the Comprehensive Test Ban Treaty.

[8] ibid p.49

[9] It should be pointed out that the Indian economy is not really driven by foreign trade. Sanctions would have an impact, but the economy would not collapse and would gradually recover. Also, a latent distrust of foreign powers in India and sanctions could rally public political support for any government that conducted a test.

considerable similarity in views between the Indian and Pakistani publics on the nuclear issue.

What these surveys indicate is that there is really no major domestic constraint on the deployment on nuclear weapons. However, as mentioned earlier, there will be significant fallout on the relationship India and Pakistan have with each other and with other countries. In the event of a nuclear of a nuclear test by either country, sanctions from the United States, and probably Japan, would follow. However, this would not necessarily be the case in the event of nuclear weapons declaration.

One author has argued that any such declaration by India would lead to embargoes of military hardware from Russia, Britain and France - three of India's key weapons suppliers.[10] This is certainly a possibility, but in the case of Russia, it is less than a certainty. Russia needs India as a customer for arms, since India is the only country in the world to actually win a conventional war using Russian equipment. The sheer monetary value of India's arms imports from Russia make a total embargo less certain. France, following its relatively independent foreign policy, may not impose an embargo, but can India's decision makers afford to take the risk ?

In Pakistan's case, it is almost certain that China would continue to supply arms to Pakistan, even if the rest of the world does not. In this sense, Pakistan may be better placed than India. On the other hand, Pakistan's domestic arms industry is far less developed than India's and in the event that China does impose an embargo, Pakistan's military credibility may well cease to exist.

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[10] V.Sahni, 'Going Nuclear', Cortright & Mattoo ed. India and the Bomb,p.100

Furthermore, an overtly nuclear South Asia may well start another series of nuclear arms races. Japan may be unwilling to accept a lower military status to India and may initiate a nuclear weapons program of its own. This would in turn create problems in South East Asia, owing to a long-standing distrust of Japanese militarism, with possibly Indonesia and perhaps other countries initiating weapons programs.[11] There could even be repercussions in the Middle East as Arab states and Iran initiate and accelerate their own nuclear weapons programs. In other words, there could well be a massive increase in the numbers of states seeking nuclear weapons and this would sound the death-knell of Western non-proliferation efforts.

On the other hand, a nuclear South Asia may have no effect whatsoever on neighbouring countries. Any detailed analysis of a possible nuclear weapons declaration by India and Pakistan would come to the conclusion that any such declaration is merely a confirmation of long standing suspicions. Is there really any difference between two un-declared nuclear powers and two declared nuclear powers ? If there is a difference, it is in the fact that declared nuclear powers can at least become part of the international dialogue on nuclear weapons. At present, since neither country admits to having nuclear weapons, they are not part of this dialogue. They are spoken to rather than spoken with. This only serves to increase domestic resentment while doing absolutely nothing to prevent them from developing nuclear weapons.

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[11] No country has actually said what it would do in the event of an openly nuclear South Asia. Moreover, it is not at all clear as to what the reaction would be from non-American Western allies in the event of either India or Pakistan conducting nuclear tests. Some may impose sanctions, others might not.

As regards sanctions, while domestic legislation in the United States virtually demands sanctions in the event of a nuclear test by either India or Pakistan, there is no international treaty demanding the imposition of economic sanctions. While countries like Japan and the United Kingdom may be tempted to follow the American lead, other countries would in all probability not react in a similar manner. And, in the event of a simple declaration of nuclear power status, it is not altogether certain that even sanctions from the United States would be incurred.

There is no international law, even in the Non-Proliferation Treaty, that demands the imposition of economic sanctions, or even an embargo on sales of conventional arms to a state that declares itself a nuclear power outside of the currently recognized five nuclear states. There would certainly be an embargo on the sale of certain high-technology items, but since both India and Pakistan are already restricted in what they can obtain in terms of nuclear technology and items related to ballistic missile development, this would not have too much of an impact.[12]

Unilateral sanctions on the part of the United States against India or Pakistan would only serve to heighten domestic mistrust of the motives of the United States and could actually strengthen support for the nuclear program. Since few countries are likely to support the United States - so long as neither country actually conducts a nuclear test - the United States could find itself isolated internationally and, perhaps far more importantly, lose whatever influence it has in the region.

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[12] India has faced sanctions on its nuclear program since its 1974 test. This led to the Canadian government's withdrawal from the construction of the two atomic power stations in Rajasthan.

The role of the United States is the subject of considerable discussion in South Asia and in the United States as has been discussed earlier. Any administration runs the risk of being perceived as partisan by either India or Pakistan and both countries are extremely suspicious of American motives in the region. The United States apparently played a major role in diffusing the crises of 1987 and 1990. These have been described in more detail in the first chapter, however, in both cases, the United States was not really seen as an unbiased observer. Reports of American offers to warn Pakistan of any Indian moves did nothing to improve India's confidence in the United States. Should the United States react with sanctions or excessive diplomatic pressure to India declaring itself a nuclear power, any residual goodwill in India will immediately evaporate.[13]

Pakistan also has no reason to have much faith in the United States since 1990 when all economic and military aid to Pakistan was suspended.[14] Pakistan has not forgiven the Americans for this. Conversely, the moves by the Clinton Administration to relax the arms embargo on Pakistan have been viewed as American support for Pakistan's nuclear weapons program and a direct threat by some groups in India. The United States seems to be in an unenviable position where it can neither please India nor Pakistan at the same time.

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[13] In the pro-bomb lobby of India there is considerable resentment over what is seen as American hypocrisy in its dealings with China as compared to India. They particularly resent America's apparently fawning respect for China's nuclear weapons while seeking to deny India the same right to nuclear weapons. A former Indian Foreign Secretary, A.P.Venkateswaran, asked 'Why is China's Power - its huge army and intercontinental ballistic missiles - considered absolutely acceptable while India's is not ?' - cited in R.H.Munro, 'Superpower Rising' *Time International*: April 3 1989,p.18

[14] The suspension of United States aid to Pakistan was done under the Pressler Ammendment. In the early years of the Clinton Administration, some of the provisions of the Pressler Ammendment were relaxed. This was done under the Brownback Ammendment of 1995 - see World Air Power Journal: Volume 27- Winter 1996, p.12 for details.

Confidence Building Measures:

There has been much speculation and debate on the issue of India-Pakistan Confidence Building Measures (CBMs). As of now, there are strictly limited CBMs in operation and these, while not completely ineffective, are far from adequate.

Over many years, India and Pakistan have agreed not to attack each others' nuclear installations and not to produce or deploy chemical weapons.[15] These were sensible measures since attacks on nuclear installations would be environmentally catastrophic and chemical weapons have never been considered viable weapons by the armed forces of either country.

In the military sphere, CBMs have been much more limited. Both sides have agreed to give advanced notification of military exercises and a 'hot-line' has been established between the opposing Directors General of Military Operations.[16] These have been aimed at reducing the possibility of a misunderstanding along the lines of 'Brasstacks' in 1986-87. However, these remained unused when India and Pakistan became involved in a massive artillery duel along the Line of Control in Kashmir in 1997.[17]

An agreement also exists to prevent airspace violations. Again, this is not particularly effective since Indian MiG-25 reconnaissance aircraft have often violated Pakistani airspace unchallenged, while a Pakistani Remotely Piloted Vehicle was

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[15] Chari, Indo-Pak Nuclear Standoff, pp.157-158

[16] loc.cit

[17] The 1997 shelling in Kashmir was exceptionally intense and involved the exchange of thousands of round of artillery shells and mortar bombs. The author was informed by Mr.'C' that the 'hot-line' remained inactive in September 1997.

intercepted by Indian aircraft and damaged over Gujarat.[18]

One Indian scholar, P.R. Chari, has proposed that these CBMs be extended to include 'hot-lines' between the air-forces and navies and an extension of the agreement not to attack each other's nuclear sites to include identified population and high value economic targets.[19] These are interesting proposals, but since the entire concept of nuclear deterrence relies on being able to threaten population centres, it is unlikely that Pakistan, in particular, will agree to any such demand. Moreover, given the fact that the 'hot-line' has not proved to be particularly effective at times of real crisis, namely last year's duel along the Line of Control, any more 'hot-lines' may be seen as purely symbolic and having no real value.

Chari further proposes that the agreement giving notification of military exercises could be broadened to provide information on the deployment of certain 'offensive' weapon systems within specified border zones.[20] This is currently not plausible since giving information on key systems such as combat aircraft, tanks and surface-to-surface missiles would render these systems vulnerable to a pre-emptive strike. Moreover, the fact that so many high value civilian and military targets in both India and Pakistan lie so close to the border ensures that no major military withdrawal from these areas can be contemplated.[21]

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[18] Interviews with Air Marshal 'E', Mr.'F' and Group Captain 'K' on 23 March 1998

[19] Chari, Indo-Pak Nuclear Standoff, p.158

[20] loc.cit

[21] To put it more bluntly, there is no way Pakistan is going to leave Lahore defenceless and India is not going to leave Amritsar without adequate troops.

This ties in with Chari's final proposal which involves extending the 'open-skies' policy to permit aerial reconnaissance of specified border areas.[22] Neither side is confident enough of the other's intentions to give such access.[23] Perhaps CBMs are needed to facilitate these CBMs ? Unfortunately, however, these ideas are at present unworkable and are likely to be unworkable for some time to come.

A critical factor in the India-Pakistan confrontation is the nuclear dimension. Under the existing system, the two sides cannot be honest with each other about even possessing nuclear weapons, much less building confidence. There is deception at the very heart of the military structures of both countries and unless they are permitted to be fully honest with each other regarding nuclear intentions, without fear of sanctions and condemnation from Washington, then all CBMs will ultimately be futile.

One issue that has not been dealt with adequately is the possibility of India and Pakistan exporting nuclear weapons technology for financial gain. Both countries are in need of hard currency and there are many states - in the Middle East in particular - that would be only too happy to purchase nuclear weapons technology from South Asia. The prospect of a cash-strapped India or Pakistan hawking nuclear weapons technology to states such as Iran, Iraq, Syria and Libya is frightening.[24]

So far, a mix of political restraint on the part of India and Pakistan, combined

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[22] Chari, Indo-Pak Nuclear Standoff, p.158

[23] At present, any aircraft that violates certain border areas is treated as hostile. Both India and Pakistan maintain interceptors on 'cockpit alert' to deal with such intruders

[24] This horrifying possibility was described in a Federation of American Scientist website report dealing with Indian nuclear weapons potential. See http://www.fas.org/spp/starwars/advocate/ifpa/report696_ch4_ind.htm

with some subtle pressure from the United States has kept the spectre of proliferation from South Asia at bay. However, will this continue ? Should sanctions be imposed on either state, then the temptation to earn desperately needed hard currency by selling nuclear weapons technology might prove to be irresistible. It is therefore imperative that both countries be brought into the international discussions on the proliferation of weapons of mass destruction. The fact that both countries have proved cooperative with respect to the proliferation of chemical and biological weapons gives some cause for optimism. However, the sooner both India and Pakistan are made partners in the international campaign against the proliferation of weapons of mass destruction, the better - even if it means recognizing these two states as nuclear powers.

Any discussion of the political implications of either India or Pakistan declaring itself a nuclear power is as yet somewhat speculative. While there have been a few statements from Washington regarding sanctions in the event of a nuclear test, there has been remarkably little reaction from the rest of the international community. As such, it is rather difficult to clearly assess exactly what their reaction would be. However, as has been pointed out in Chapter Two, both India and Pakistan have moved so far along the path to nuclear weaponization that the day of an overt declaration of nuclear capability may be in the not too distant future.

Aa number of things are clear. There is considerable domestic support for nuclear weapons in both India and Pakistan. In the case of India, a sizeable percentage of the population also supports nuclear testing even in the event of economic sanctions from the United States. The United States is not trusted by either India or Pakistan and

as such has to tread carefully when dealing with these two countries in order to prevent a total loss of influence in South Asia. Finally, the current Confidence Building Measures are almost a complete farce. Without being honest about the critical nuclear issue, how can either country trust the other enough to have faith in the CBMs ?

Ultimately, the world, and the United States in particular, will have to contend with a nuclear India and a nuclear Pakistan. It is then going to be up to the governments of India and Pakistan to initiate steps to discuss the nuclear issue honestly with each other and to gradually build confidence between the two countries. Unfortunately, the past record of confidence building measures between the two countries does not give much cause for optimism.

## Conclusion

South Asia remains plagued by the seemingly incessant hostilities between India and Pakistan. Almost everything else, including human and political development is held hostage to this hostility. Military expenditure in Pakistan consumes a massive share of the country's budget while India spends considerably more on defence than it does on primary health-care and education. The increasing proxy war between India and Pakistan continues to take a heavy toll of civilian lives while serving to exacerbate the already appalling state of affairs between the two rivals.

Into this already somewhat explosive mixture must be added the nuclear factor. As has been shown in the preceeding chapters, India and Pakistan have advanced a long way down the path of nuclear weaponization. Both nations see nuclear weapons as being necessary for their very existence. Indeed, chapter one argued that, in a strange way, nuclear weapons are linked to internal security.

India and Pakistan have a significant nuclear weapons capability.[1] Both have extremely advanced nuclear weapons and ballistic missile programs and both maintain large air forces with sizeable numbers of nuclear capable strike aircraft.[2] India, in particular, has an advanced space program which could provide the basis for more advanced ballistic missiles in the near future. Both countries have already deployed short-range ballistic missiles, though it is uncertain whether these have been equipped with nuclear warheads or not. Nonetheless, the extent of the existing missile and nuclear

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[1] This is discussed in detail in Chapter Two

[2] See Chapter Three

weapons projects means that India and Pakistan may be more accurately defined as *de facto* nuclear weapons states rather than as 'threshold' nuclear weapons states.

However, as far as command and control goes, many questions remain unanswered. These include questions regarding the security and redundancy of these command and control facilities. Questions also exist regarding the amount of political control exerted by the civilian authority in Pakistan. As South Asia rapidly progresses down the path towards overt nuclearization, it is of paramount importance for regional, as well as international stability, for these command and control features to be strengthened. The thick veil of secrecy surrounding the nuclear programs in India and Pakistan means that accurate information regarding command and control structures is difficult to obtain. For any degree of nuclear stability to exist in South Asia there need clearer signals from the Indian and Pakistani governments regarding their command structures. Unless this step is taken, it is impossible for either country to make a proper assessment of where the nuclear threshold lies. The United States and the former Soviet Union put in place extremely advanced command structures with many layers of redundancy. While South Asia may not need to replicate American and Soviet command structures, something better than the existing, somewhat *ad hoc,* systems needx to be developed. It must also be remembered that unlike the United States and the former Soviet Union, India and Pakistan share a common border and routinely exchange artillery fire. With this in mind, the need for a stable and secure command and control structure becomes even more apparent.

This thesis has also shown that nuclear weapons have very little use against

military targets in the South Asian context.[3] The armed forces of India and Pakistan are slowly preparing for nuclear, biological and chemical warfare, but neither side seems to be moving towards a nuclear war-fighting doctrine. The battlefields of the India-Pakistan conflict do not lend themselves to the tactical use of nuclear weapons. Nuclear weapons would have very little effect against the massive network of linear defences that stretch from Southern Jammu & Kashmir down to North/Central Rajasthan, and in South Rajasthan and Gujarat, where nuclear weapons could conceivably be used, the mechanized formations of the strike corps on both sides may not be rendered combat ineffective by a nuclear strike. Moreover, given that there is such ambiguity of targeting and escalation in South Asia, it is distinctly possible that a nuclear strike on an armoured formation would be answered with a massive strike on civilian targets.

The vulnerability of South Asian cities to a nuclear strike has also been examined in chapter five, and it can be safely concluded that despite the presence of substantial air defences and limited civil defence networks, the destruction that a nuclear strike would wreak on an Indian or Pakistani city would be absolutely catastrophic. It is this fear of massive retaliation that serves both to limit war in South Asia on one hand, while rendering nuclear weapons tactically unusable on the other.

Are nuclear weapons keeping the peace in South Asia ? This thesis argues that this may not entirely be the case. India has altered its military tactics and has limited its objectives in any war that may emerge.[4] Nuclear weapons serve to limit war, but do not

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[3] See Chapter Four pp.174-178

[4] Refer to Chapter Five pp.215-216

necessarily keep the peace. It has been argued that the real reason for the uneasy peace that has been kept in South Asia for the past twenty-five years is in the basic operational parity that exists between India and Pakistan in conventional forces and ballistic missiles. With comparable standards of training and equipment, the Indian and Pakistani armies have maintained this operational parity for some time.

While India strives to break this operational parity, Pakistan strives to preserve it. This extends to the creation of a third Pakistani Armoured Division to match India's three Armoured Divisions. Perhaps far more ominously, in the area of ballistic missiles, Pakistan has managed to reduce India's advantage in production capacity and technology by not only importing missiles, but by also purchasing a factory to produce such systems from China. It is this uneasy military balance that has kept the peace in South Asia.

Nuclear weapons play an extremely important role in limiting war, but play a much more peripheral role in preventing war from occurring in the first place.[5]

The political implications of nuclear weapons in South Asia are somewhat uncertain. As discussed in chapter six of this thesis that India and Pakistan would be unlikely to test nuclear weapons for fear of sanctions. However, as discussed in chapter six, there is a widespread consensus in favour of keeping the nuclear weapons option 'open' and a fair minority support overt nuclearization. Moreover, if poll data from India is to be believed, a substantial number of people support nuclearization even if sanctions are enforced on India. Sanctions may hurt the Indian economy badly, but the Indian economy will survive. The effects of sanctions on the Pakistani economy will

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[5] Chapter Five pp.216-220

undoubtedly be far more severe, but, as in the case of India, there is widespread consensus on the retention of the nuclear weapons option.

Will India and Pakistan go to war ? There have been some very close calls in the recent past - the 'Brasstacks' crisis of 1987 and, allegedly, the crisis of 1990. In both cases a combination of pressure from the United States and the underlying operational parity existing between India and Pakistan forced both sides to back down. If the crisis of 1990 is any indication of things to come, then the existence of a Pakistani nuclear deterrent - which was revealed in 1987 - proved to be no deterrent to the possibility of war. War was averted by outside pressure and by operational parity.

Should the operational parity existing between these two antagonists break down, war becomes a distinct possibility. This operational parity is maintained by conventional arms and as such, renewed attention has to be given to the burgeoning conventional arms build-up that is taking place. To date, budgetary constraints have, to some extent, affected expansion programs. However, the India economy in particular, even if sanctions are imposed, may be in a position to support at least some of the armed forces modernization programs. In Pakistan's case, every effort will be made, even if the economy slides further into recession, to maintain the operational parity.[6]

This thesis has argued that the attempts at Confidence Building Measures (CBMs) between India and Pakistan have been fundamentally flawed because of the ambiguity and dishonesty surrounding the nuclear issue. Neither side has any faith in the promises of the other and, combined with the underlying dishonesty over the true

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[6] Refer to Chapter Five pp.216-220. These are the pages quoted in footnotes 4 & 5 in this chapter.

state of nuclear and missile programs, there is very little scope for effective confidence building measures. It was also mentioned that the 'hot-lines' that exist between the Indian and Pakistani military leadership were not even used when a series of intense artillery duels took place along the Line of Control.

The Kashmir issue, which is central to the India-Pakistan conflict, is far from any kind of resolution. India will not yield an inch of Kashmir and Pakistan will not halt its claims on Indian Kashmir, nor will it cease its support for the ongoing insurgency. India and Pakistan do not seem to have any room to compromise on this issue. The violence will continue, and both India and Pakistan will continue their antagonistic relationship in an unhealthy atmosphere of mutual suspicion.

It is this environment of distrust and suspicion that envelopes South Asia and is responsible for making this area so prone to conflict. Unless India and Pakistan can be persuaded to take steps to build mutual confidence and to reduce tension along the international borders and the Line of Control, South Asia will continue to be haunted by the spectre of nuclear Armageddon.[7]

Into this heated environment, India's relationship with its massive neighbour, China, must be considered. India regards China with a great deal of suspicion, while for the most part, China has continued to arm Pakistan while ignoring the border dispute that exists between India and China.[8] These two massive countries have yet to take

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[7] A more detailed analysis of the scale of the destruction that might be wrought by nuclear attacks on civilian targets is found in Chapter Five pp.196-200

[8] China's involvement in Pakistan's missile program was discussed in Chapter Three pp.113-115, while China's involvement in Pakistan's nuclear program was dealt with in Chapter Two p.76 & p.79.
For a discussion of the unresolved Sino-Indian border dispute, see R.G.C. Thomas 'South Asian Security in the 1990s' ( London: IISS, 1993 ) pp.12-14

serious steps to resolve any of their outstanding differences.

In the introduction of this thesis, the debate currently taking place in the West regarding th future of nuclear weapons was briefly discussed. In the South Asian context, the debate on nuclear weapons is hampered by the fact that nobody is sure exactly what the status-quo actually is. During the decades of the Cold War, both NATO and the former Warsaw Pact evolved a complex and intricate nuclear strategy based on their perceptions of the intent of rival forces and on each others' strengths and weaknesses. In South Asia, much of the debate is as yet more basic and is largely confined to the question as to whether nuclear weapons should be developed and deployed or not.

India and Pakistan illustrate the limited influence of the five recognized nuclear powers to promote non-proliferation. As laid out in the introduction, Michael Quinlan's rationale for the continued retention of nuclear weapons by Western states, while at the same time limiting proliferation to others, sounds 'hypocritical'.[9] India, as discussed in chapter one, has been a long-standing advocate for a nuclear weapons-free world. However, no substantive moves have been undertaken by the established nuclear states to disarm. John Baylis pointed out that even the arms reduction treaties that have been signed between the United States and Russia would keep the nuclear framework of the Cold War essentially intact.[10] This, to continue Michael MccGwire's arguement as laid out in the introduction, gives little incentive for either India or Pakistan to renounce

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[9] See M.Quinlan, 'The Future of Nuclear Weapons' , *International Affairs*: July 1993,pp.485-496

[10] J.Baylis, 'The Future of Nuclear Weapons', *International Relations*: August 1997,pp.1-14

nuclear weapons.[11]

In the introduction, Shekar Gupta's *Adelphi Paper* was cited for its discussion of the shift in Indian foreign policy from one based on ideals to one increasingly based on pragmatism.[12] Nowhere is this clearer than in the nuclear and missile fields. As has been shown in this thesis, India and Pakistan have continued to develop and refine their nuclear weapons capability and their ballistic missile potential inspite of efforts from the United States to persuade the two rivals to desist from such moves.

As of April 1998, neither India nor Pakistan has made any overt moves towards nuclear weapons deployment. However, this does not mean that India and Pakistan have not deployed nuclear weapons - it just means that we don't know about it. Both countries surround their nuclear programs in secrecy and accurate information, even on conventional military forces, is very difficult to obtain. With these limitations, it is probable that the world will know the true status of nuclear weapons programs only in two possible circumstances: either India or Pakistan announces that it is a nuclear weapons state, or, if either country begins nuclear testing.

Some analysts, George Perkovich among them, have argued that a state of non-weaponized or 'existential' deterrence exists between India and Pakistan.[13] The problem with this concept is that it assumes that neither India nor Pakistan has weaponized. In chapter two of this thesis it can be seen that, given the vast nuclear capabilities

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[11] M.MccGwire 'Is there a future for nuclear weapons', *International Affairs*: April 1994,pp.211-228

[12] S.Gupta, 'India Redefines its Role' Adelphi Paper 293 ( London: IISS, 1994 )

[13] G.Perkovich, 'A Nuclear Third Way in South Asia', *Foreign Policy*: Summer 1993,pp.85-104

developed by both states and their seemingly implacable steps towards weaponization, that this assumption is dangerous.

From the evidence that has been presented in this thesis, the emergence of India and Pakistan as nuclear weapons states seems inevitable. With the rise to power in India of the decidedly pro-nuclear Bharatiya Janata Party, India's emergence may be close. The BJP has made no secret of its nuclear plans, and while it will have to contend with an extremely hostile international reaction, internal party and domestic compulsions may well decide the issue. Moreover, India's security concerns have not diminished - neither have Pakistan's - as such the emergence of an overtly nuclear South Asia may nearer than expected.

## Epilogue

In May 1998, just as this thesis was being printed, the nuclear landscape of South Asia changed forever. On May 11 1998, Prime Minister Atal Behari Vajpayee of India announced to a stunned world that India had conducted three underground nuclear tests, which were followed by two more on May 13 1998. The Western world responded with a series of sanctions and a number of extremely harsh messages while simultaneously trying to persuade Pakistan not to follow India's lead with a number of incentives.[1]

The incentives did not work. Two weeks after the Indian nuclear tests, Pakistan followed suit with six nuclear tests of its own. The Prime Minister of Pakistan blamed India for his need to test while chastising the West for not being harsh enough with India. The nuclear arms programs of South Asia were now out in the open.

This epilogue was written to examine the nuclear tests and their implications for the conclusions made in this thesis. It has been only a few months since the tests and the full impact of the tests in terms of the India-Pakistan conflict is as yet unclear. The nuclear plans of both countries continue to be shrouded in secrecy and the sizes of the nuclear arsenals planned are still classified. However, it is vital that the tests be examined as they provide some vindication for the assessments of the status of the Indian and Pakistani nuclear programs made in this thesis.

In terms of the India-Pakistan confrontation, this epilogue will argue that the

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[1] The United States offered to lift its military embargo on Pakistan and deliver 28 F-16 fighters while considering the transfer of other high-technology military items. Japan and Canada offered increased foreign aid in exchange for Pakistani restraint. See Z.Hussain & R. Chengappa, 'Bang for Bang', *India Today*: June 8 1998,pp.12-14

essential conclusions will remain unaffected. However, this is not the case in the India-China confrontation where the tests have a profound impact.

The Tests: What types of designs were tested

Pokhran-2:

On May 11 1998, India announced that it had tested a fission device, a low-yield device and thermonuclear device. Two days later, these tests were followed by two more sub-kiloton tests.

Known as 'Operation Shakti-98', the five tests had a recorded seismic magnitude of 5.0+/- 0.4 on the Richter scale.[2] By May 14, Indian seismologists at the Bhabha Atomic Research Centre (BARC) stated that an analysis of the data received at the Gauribidnaur Seismic Array indicated that the yield of the May 11 1998 blasts was around 55 kilotons.[3] They also indicated that the seismic waveform was very complex because the explosions were carried out simultaneously.

The first group of tests - Shakti I,II & III - consisted of a two stage thermonuclear device with a yield of 43-45 kilotons (kt), a lightweight fission device with a yield of 12-15kt and a low-yield subkiloton device of 0.2 kt. These were placed in two shafts, one kilometre apart, and simultaneously detonated from a control located 3.5km away.[4] Shakti IV & V had yields of 0.5 and 0.3 kilotons and were conducted to provide

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[2] 'India goes Thermonuclear' -http:// www.fas.org - p.2 This site provides the finest analysis of the Indian nuclear tests available. It is detailed, easy to understand and systematic.

[3] loc.cit.

[4] loc cit.

additional data for improved computer simulation of designs.[5]

Almost immediately a somewhat unseemly row erupted between Indian scientists and certain American seismologists regarding the yields of the devices. Preliminary estimates put the combined yields at anywhere between 10 and 25 kilotons and some questioned whether India had actually tested a thermonuclear device based on these yield estimates.[6] This row continues with an American scientist - Dr.Terry Wallace - giving a yield of 10-15 kt and practically accusing the Indians scientists of lying.[7]

According to David Albright, a scientist at the Institute of Science and International Security in Washington D.C, the lower estimates were largely due to the fact that a few Western scientists were of the view that India's first atomic test in 1974 fizzled and produced a yield of only 2kt.[8] However, P.K Iyengar, former chairman of India's Atomic Energy Commission, has stated that the yield was between 8-10kt based on radiochemical analysis of samples of bomb debris taken from the shaft.[9]

Soon after Wallace's article, three Indian scientists writing in *Current Science*, gave a detailed account of why Wallace was wrong. These scientist pointed out that there was a very large variation in the estimates of the body-wave magnitude made by

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[5] loc cit.

[6] ibid p.3

[7] Wallace's report was discussed in the *LA Times*: 16 September 1998. An interesting point was made at the end of the article where an American nuclear weapons scientist indicated that even 15 kilotons could have been a thermonuclear device and said that the seismologists had an inadequate knowledge of nuclear weapons design.

[8] The reports about the 1974 test having a yield of only two kilotons surfaced in an article back in 1981 in the *Sunday Observer*: 30 August 1981 by Y.Aggarwal. While a few Western experts may cite this, there appears to be a consensus that the 1974 test had a yield of 8-12kt.

[9] D.Albright, 'The Shots heard 'round the world', *The Bulletin of the Atomic Scientists*: July/August 1998 This article was found on the bulletin website http://www.bulletinofatomicscientists.com

different seismic stations. The variations at stations at similar distances from the explosion site varied by a staggering factor of 30 - or three times as much as expected.[10] The scientists pointed out that seismic stations located to the east and west of Pokhran recorded lower magnitudes than those located to the north and south of Pokhran. Since two large explosions - the thermonuclear device and the fission device - were detonated in separate shafts one kilometre apart in an east-west direction, delays between the two signals could result in seismic stations recording lower strengths than the actual values.[11]

The article went on to say that seismic stations to the north and south of Pokhran would have the least time delay and so would record the highest signal strength, while those to the east and west would have the maximum delay. Averaging out all seismic stations would therefore lower the value. Moreover, the true body-wave magnitude would have to be obtained by superposing the signals from the two powerful explosions.[12]

The scientists, Dr. S.K. Sikka, Dr. Falguni Roy and Dr. G.K.Nair of the BARC High Pressure Physics Division, believed that a true estimate of the body-wave magnitude could only be obtained by taking the data from seismic stations to the north and south of Pokhran. The data from 10 to the north and two to the south indicated a body wave magnitude of 5.36. If the reading of one station was excluded because the

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[10] 'BARC scientists defend estimates of n-tests' *The Hindu*: September 19 1998
This article received little notice in the West and was remarkably poorly covered in India.

[11] loc.cit

[12] loc.cit

signal to noise ratio was too low, the average value rose to 5.39 which tallied with BARCs own measurements at Gauribidanaur. This data was in agreement with the yield claims made by Indian weapons scientists.[13]

To complicate matters further, Dr. Roger Clark, a seismologist at Leeds University, stated that after data from 12 seismic stations was taken into account, the yield estimate was close to 60kt.[14] The US Geological survey indicated that the body-wave magnitude was 5.2 which suggested a yield of 30-60 kilotons.[15]

Of great concern was the fact that the May 13 explosions were undetected. This has led to scientists like Wallace alleging that these tests never took place. However, Clark points out that if the Indians tested in a sand dune, as claimed by Dr.Chidambaram, or if the devices were exploded in a large cavity, then the tests could have been completely concealed. The other possibility was that the tests were hydronuclear or sub-critical tests as was claimed by Dr.Raja Ramanna.[16]

There was another major controversy over India's nuclear tests. There was considerable doubt that India had detonated a thermonuclear device. Once the yield estimates were more or less verified, doubts focussed on the fact the device seemed to have a low yield. The yield of 43 kilotons was said by some to be too small for a

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[13] loc.cit.

[14] D.MacKenzie, 'Making Waves' in *New Scientist*: 13 June 1998

[15] S.van Moyland & R.Clark, 'The Paper Trail' in *The Bulletin of the Atomic Scientists*: July/August 1998 One of the most puzzling aspects of this whole saga is that Wallace agrees with the body-wave magnitude of 5.2, but sticks to his assessment of 15 kilotons. In other words, a body-wave magnitude of 5.2 could mean a yield of between 15 and 60 kilotons

[16] loc.cit

thermonuclear device and questioned whether India's device had worked as planned.[17]

This is factually incorrect . The United States, for example, tested two thermonuclear devices in 1953 with yields of 23 and 43 kt.[18] Dr. Frank Barnaby, writing in Jane's Defence Weekly also disagreed, stating that thermonuclear devices did not need to be tested at full-yield and could be limited to firing the nuclear-fission trigger and producing a small amount of fusion energy.[19] Also, from chapter two of this thesis, it has been shown that India had all the components in place for a thermonuclear design.[20] As such, scepticism in this regard seems unwarranted.

Dr. Barnaby suggests that an operational Indian thermonuclear weapon is likely to contain a boosted-fission nuclear trigger giving an explosion of 50kt which would produce 500kt in the fusion stage. He further suggests that a variable yield nuclear weapon could be produced in this way, allowing a yield of 5kt, 50kt or 500kt to be chosen.[21] An Indian nuclear scientist claimed that the device tested was a 'third-generation' fusion device.[22] Moreover, it has also been suggested that if India's stocks of weapons grade plutonium are used to make triggers for thermonuclear weapons instead

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[17] One of the most misleading statements was made by T.S.Gopi Rethinaraj, 'India's blasts surprise the world, but leave fresh doubts', p.22 in *Jane's Intelligence Review*: July 1998. He states that the Pokhran test range is big enough to carry out megaton sized explosions. This is not correct. There was significant damage to surrounding villages even from the 43 kt device. A device of even 100kt might well have leveled the villages.

[18] These were tests 'Badger' and 'Simon' conducted as part of test series 'Upshot-Knothole' see http://www.fas.org

[19] F.Barnaby, 'Trials provide data for range of weapon yields' , *Jane's Defence Weekly*: 27 May 1998,p.3

[20] See Chapter Two pp.62-63、

[21] Barnaby, 'Trials provide data for range of weapon yields'

[22] *Indian Express:* May 31 1998 - Latest News section

of normal fission weapons, then Indian could conceivably manufacture as many as 500 thermonuclear weapons.[23] This is not to say that India will manufacture this number of weapons, but that it could should it so decide.

The fact that three of India's tests were in the sub-kiloton range is very significant. These tests would considerably enhance India's computer simulation capabilities.[24] However, these tests are very sensitive to physical parameters such as the amount of fissile material present, the degree and uniformity of compression and the nuclear properties of the materials. There is a good chance of these devices overshooting or undeshooting their intended values, but the data they provide would be invaluable for computer simulation.[25]

These sub-kiloton devices now give India the ability to make truly small tactical nuclear weapons suitable for artillery shells or for use against troops in unprotected positions. However, one very significant point about these tests, from a nuclear weapons design point of view, is that India may have experimented with deuterium-tritium boosting of fission devices.[26] These can be used for manufacturing light, efficient, pre-detonation proof primaries for thermonuclear weapons, of the kind suggested by Frank Barnaby above.[27]

Since gas-boosted primaries are immune to predetonation problems, weapons-

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[23] 'India's Nuclear Might' in *Foreign Report*: June 11 1998

[24] 'India goes Thermonuclear' pp. 9-10

[25] loc.cit

[26] ibid p.10

[27] This technology has been adopted by all five of the nuclear weapons states.

grade plutonium need not be used. Reactor-grade plutonium thus becomes a viable alternative. With this in mind, India could make many more nuclear weapons than is sometimes assumed. There is enough separated plutonium for 400 weapons and enough discharged plutonium for 1200.[28] This means that India could potentially be a larger nuclear power than even China.

Chagai-1

After that somewhat lengthy analysis of India's nuclear tests, Pakistan's tests are a good deal easier to examine. Much of what has been said regarding yield analysis of India's nuclear tests can be applied in the case of Pakistan.

Pakistan claimed to have conducted a total of six tests between May 28 and May 30 1998. Dr A.Q.Khan claimed that the largest test had a yield of 30-35 kilotons and was a boosted fission device, while four others were tactical weapons with a low-yield.[29] There was also allegedly another 12 kiloton fission device.[30]

Once again, the seismic data showed major variations, with an indication that the total explosive yield was between 7 and 8 kilotons.[31] The alleged boosted-fission tested apparently gave a seismic reading of only 2-3kt.[32] Given that Pakistan has been in possession of a viable nuclear weapon design from China, with a yield of 20-25 kt, it is

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[28] 'India goes Thermonuclear' p.10

[29] W.P.S.Sidhu, 'High price exacted for Pakistan's one-upmanship', *Jane's Intelligence Review*: July 1998, p .29

[30] http://www.fas.org/guide/pakistan/nuke/index.html There is some discrepancy here since two 12 kt weapons are listed and only 3 instead of four low-yield devices.

[31] F.Barnaby, 'Discrepancies claimed in Islamabad's nuclear tests' - http: www.jdw.janes.com: 9 June 1998

[32] loc.cit

rather surprising that the seismic readings were so low.[33]

However, just as there were many factors that rendered the seismic analysis of India's tests somewhat suspect, the same would probably hold true for Pakistan as well, though Pakistan's scientists have not come out as vociferously in defence of their claims as India's. Dr. Frank Barnaby points out that the yield discrepancies may be due to the fact that Pakistan conducted its test in a horizontal tunnel rather than a vertical shaft and that this would reduce the detectable yield.[34]

Moreover, there is no reason to doubt that Pakistani nuclear-weapons designers could produce a boosted-fission weapon. As discussed in chapter two of this thesis, Pakistan has been trying, apparently successfully to obtain tritium - a key component in boosted fission weapons.[35] Dr. Barnaby estimates that a Pakistani operational boosted fission weapon would have a yield of about 150kt.[36]

Unlike India's case, Pakistan's tests do not actually enhance the nuclear weapons production or stockpile level. Pakistan, unlike India, uses enriched uranium rather than plutonium. Pakistan cannot, therefore rely on reactor-grade rather than weapons-grade material the same way India could. However, when Pakistan's new Chinese designed nuclear reactor and reprocessing plant come on line, Pakistan may be able to produce about three nuclear weapons per year from plutonium.[37]

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[33] W.P.S. Sidhu, 'High price exacted for Pakistan's one-upmanship' p.28

[34] Barnaby, 'Discrepancies claimed in Islamabad's nuclear tests'

[35] See chapter two p.73

[36] Barnaby, 'Discrepancies claimed in Islamabad's nuclear tests'

[37] loc.cit.

Perhaps the last word on the South Asian tests should go to the Federation of American Scientists- a reminder that estimates in Washington or London are not always best:

> Estimating nuclear explosive power from distant seismogram measurements is not a precise activity, an error factor of two or more is not unusual.[38]

The Rationale Behind the Nuclear Tests

It seems that India's nuclear test plans go back to at least 1996 when, among the only acts undertaken by the fragile 13-day government of Atal Behari Vajpayee, was the approval for a series of nuclear tests.[39] The May 1998 tests were in a real sense a continuation of the BJPs long-standing commitment to developing nuclear weapons.

As mentioned earlier in this thesis, the Sino-Indian war of 1962 and the subsequent Chinese nuclear test in 1964 provided the initial spark for the Indian nuclear weapons program. Here again, it was China rather than Pakistan that was used to justify the tests. China's long cooperation with Pakistan in the ballistic missile field and the continued American infatuation with China were seen as major concerns by the BJP-led coaliton.[40]

Moreover, India's new ( and rather colourful ) Defence Minister, George Fernandes, described China as India's potential 'threat No.1'.[41] Pakistan's April 6 1998

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[38] 'India goes Thermonuclear' p.3

[39] M.Joshi, 'Nuclear Waves',p.14 in *India Today*: May 25 1998

[40] ibid pp.14-15. In a somewhat uncharacteristic display of pique, the Chinese Foreign Minister Tang Jiaxuan, telephoned U.S. Secretary of State, Madeleine Albright, on May 14 not only to persuade India to stop testing but to dismantle its entire nuclear program.

[41] R.Chengappa & M.Joshi, 'Hawkish India', p.11 in *India Today*: June 1 1998

test of an Intermediate Range Ballistic Missile - the Ghauri - with a claimed 1500 km range was the final straw.[42] India believed that its military position against both China and Pakistan was deteriorating.[43] To restore the credibility of its deterrent, the Indian government embarked on the Pokhran-2 test program with the intention of fully weaponizing India's nuclear weapons capability against Pakistan and China.[44]

There was also something of a domestic political agenda. The Vajpayee government was plagued with turmoil from one of its South Indian allies. It is possible that the government hoped to boost its somewhat battered image by conducting the tests. While the majority of Indians supported the tests, some state assembly elections held shortly afterwards indicated that voters were more concerned with local issues rather than national ones.[45]

In the case of Pakistan, the rationale is much easier to understand. The Nawaz Sharif government was under intense pressure from the Pakistani public to respond to the Indian tests in order to prove Pakistan's deterrent.[46] Though Pakistan was offered some incentives from the United States and Japan not to follow India, domestic compulsions were much too strong and the incentives much too small for Pakistan to

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[42] Joshi, 'Nuclear Waves' p.14

[43] The Ghauri test was very much the proverbial final straw. For the first time Pakistan could now target most major Indian population centres with ballistic missiles.

[44] This may take quite a while. India can put together an effective deterrent against Pakistan without difficulty. However, India's deterrent against China would need to be based on IRBMs and these require both time and money before they become fully operational in adequate numbers.

[45] ibid p.15 The BJP came under heavy criticism from the Communist parties in India who resented the hostility to China. The other parties showed a great deal of confusion in their response with no unified response from the Opposition being possible.

[46] Z.Hussain & R.Chengappa, 'Bang for Bang', p.12 in *India Today:* June 8 1998

refrain from testing.[47]

As in India, the public overwhelmingly supported the tests. This prompted one Indian magazine to say that it was as if Pakistan had rediscovered its identity.[48] Pakistan shrugged off the sanctions that were imposed as it viewed them to be of secondary concern after its primary concern of national security. Pakistan offers an excellent example of the limits of international influence. The West offered every incentive to Pakistan to desist from testing, yet Pakistan followed India's lead since they thought that testing was in their national interest.

The Military Implications - Has anything changed ?

One of the surprising things about the nuclear tests is that very little has fundamentally changed in the military situation between India and Pakistan. The nuclear threshold has certainly been lowered, but, as this thesis has argued in earlier chapters, both countries have lived with *de facto* nuclearization for more than a decade. Both India and Pakistan had to assume that nuclear weapons could be fielded by their opponent at very short notice. The nuclear tests only mean that covert nuclearization has become overt nuclearization.

However, some critical questions remain: what will nuclear doctrine consist of; who will control the arsenals; what size are the arsenals going to be and will India and Pakistan make a large scale deployment of low-yield tactical nuclear weapons ? It is

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[47] One offer from the United States was to give Pakistan 28 F-16s that had been embargoed. Pakistan's response was 'you're giving us what we've already paid for'. Canada went so far as to offer Pakistan India's share of Canadian assistance while Japan offered aid and loans in the billion dollar range. All were rejected. See footnote 1 of this Chapter

[48] Hussain & Chengappa, 'Bang for Bang', p.12

perhaps too early to make any definite comments on these issues, but there are some trends available, especially from India where the Indian government and media have commented extensively on India's nuclear intentions.

In August 1998, the Indian government began to outline its evolving nuclear doctrine. The government stated that India would maintain a credible, minimum deterrent without further testing.[49] India, like China would not use nuclear weapons against non-nuclear weapons states and would not be the first to use nuclear weapons against another nuclear weapons state. Moreover, India would not be adverse to discussions on the Fissile Materials Cut-Off Treaty.[50]

Rather surprisingly, Pakistan has kept quiet about its own nuclear doctrine. Dr. W.P.S.Sidhu, writing in Jane's Intelligence Review argues that Pakistan has an elaborate doctrine of use that involves targetting civilian and economic targets.[51] Pakistan is unlikely to adopt a no-first use policy since this would negate the deterrent effect of nuclear weapons against India.

The issue of nuclear doctrine leads to the extremely important question of nuclear command and control. As mentioned at the end of chapter three of this thesis, there are serious concerns regarding the command and control of nuclear forces in both India and Pakistan. Since the nuclear tests, neither country has been sufficiently forthcoming with information on their proposed command structures to allay these

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[49] 'India evolves Nuclear Doctrine' in *Times of India*: August 5 1998

[50] loc.cit.

[51] W.P.S.Sidhu, 'Pakistan puts its nuclear cards on the table', p.27 in *Jane's Intelligence Review*: July 1998

fears. The only comments made on the matter have been from India's Defence Minister. George Fernandes has consistently stated that control of India's nuclear arsenal would be in the hands of the political leadership and that the command and control systems were now being worked out.[52] A chain of command is also being established as it is understood that a national command post is being set up outside Delhi with the capacity to survive a direct hit.[53] Moreover, a consensus seems to be building in India on a system of divided control where warheads are kept by a separate establishment in order to reduce the risk of accidental launch.[54] Pakistan, however, has said virtually nothing regarding its nuclear command plans, this means that the concerns raised at the end of chapter three are still valid and addressing these concerns will go a long way towards allaying fears about accidental launches or unauthorised use.[55]

The sizes of nuclear arsenals planned by both sides is still classified. However, India seems to be moving towards a minimum deterrent based on IRBMs (Agni), SRBMs (Prithvi) and manned aircraft with a total of about 100 warheads.[56] India has initiated work on an extended range variant of the 'Agni' IRBM with a range exceeding 3000km, thus enabling practically all major Chinese cities within range of Indian delivery systems.[57]

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[52] 'Government will control India's nuclear establishment' in *The Deccan Herald*: August 9 1998

[53] R.Chengappa, 'Worrying over Broken Arrows' in *India Today*: July 13 1998

[54] loc.cit

[55] See chapter three pp.113-121

[56] Chengappa, 'Worrying over Broken Arrows'

[57] W.John, 'New Agni's range will be double of Ghauri' in *The Pioneer*: August 21 1998
It has also been revealed that the initial version of the Agni had a CEP of 40 metres at 1500km

In the inital stages, some Indian defence analysts have argued that a fast-track approach could be taken for deploying a total of 60 warheads on 20 'Agnis', 20 'Prithvis'- on mobile platforms as well as 20 aircraft gravity bombs and a command and control system within five years.[58] There has also been some assessment of the costs involved. This 60 warhead force would cost only Rs.5,000 crore ( Rs. 50 billion ) over five years which is by no means excessive.[59] General Sundarji, writing in 1996, came up with a cost of Rs.2,760 crore - Rs.600 crore for 150 warheads, Rs.360 crore for 45 'Prithvis' and Rs.1,800 crore for 90 'Agnis'.[60] As long as India does not get too ambitious ( such as building nuclear submarines with SLBMs), the costs are not going to be excessive in the short term.

In Pakistan's case, a limited number of nuclear warheads is probably already available. Estimates made in July 1998 gave the numbers of Pakistani nuclear weapons as between six and twenty-five before the May tests. If the May tests are factored in, the size of the Pakistani arsenal comes down to between a dozen and eighteen.[61] Pakistan probably has around thirty M-11 missiles and possibly as many as a dozen 'Ghauri' IRBMs.[62]

To equip all its missiles with warheads, Pakistan would need at least forty warheads. It currently has probably around a third of what is required. Given the fact

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[58] M.Joshi, 'Marginal Costing' in *India Today*: June 1 1998

[59] loc.cit.

[60] loc.cit.

[61] Sidhu, 'Pakistan puts its nuclear cards on the table', p.26

[62] ibid p.27

that Pakistan's nuclear weapons production capacity, as mentioned earlier in this chapter, is between two to five nuclear weapons per year, it might take a few years before Pakistan is capable of arming all its missiles with nuclear warheads.

One factor that lowers the costs of nuclear weaponization in both India and Pakistan is the fact that a substantial number of the components necessary are already in place. For example, both countries have aircraft that can accept nuclear gravity bombs without difficulty and both have SRBMs in production and IRBMs on the verge of production. If, as is suspected, India and Pakistan have a covert arsenal, then the costs of warhead production will be further reduced. So long as neither country decides to develop and deploy hundreds of nuclear warheads or intends to develop extremely expensive systems such as ballistic missile submarines, then the costs of nuclearization are not going to be excessive. However, nuclear weaponization tends to acquire a momentum all of its own and anything can happen.

The other issue that needs to be addressed is whether India and Pakistan intend to develop low-yield tactical nuclear weapons for use on the battlefield. This thesis has argued that neither India nor Pakistan is moving towards a tactical nuclear warfighting doctrine in part because of the fact that neither side could deploy the very low-yield nuclear devices employed by the former Warsaw Pact and NATO.

The May 1998 tests have forced a partial reevaluation of this argument. In chapter four of this thesis, it was pointed out that the fortified defences that dominate the South Asian battlefield - from Southern Jammu and Kashmir to North/Central

Rajasthan - are practically invulnerable to attacks by weapons of up to 20 kilotons.[63] Therefore, tactical sub-kiloton weapons would have no tangible impact on these fortifications.

Against mass armoured formations, sub-kiloton atomic devices would have a very limited effect, owing to the protection afforded by armour against blast and radiation effects. However, should either country begin moves to develop and deploy enhanced-radiation weapons - 'neutron bombs' - then there is a real possibility that such weapons could be very successfully employed against possible breakthroughs by enemy armour. With this in mind, the statement by Dr. Santhanam that India could develop enhanced radiation weapons must assume great significance.[64]

In Jammu and Kashmir, it is unlikely that these weapons would be used by either side for fear of alienating the local population. This is politically unacceptable to both countries. Therefore, as argued in chapter four, there is little chance of either country making a large scale deployment of tactical nuclear weapons since their utility would be severely limited. If enhanced-radiation weapons are developed, the previous statement may no longer hold true.

India may make a limited deployment of sub-kiloton tactical weapons, despite their limited utility, not to deal with Pakistan, but to cope with India's other main adversary - China. In fact, one Indian analyst has written that the real significance of India's tests was not so much the ability to develop thermonuclear weapons, but in the

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[63] See chapter four pp.146-149

[64] 'India capable of making neutron bomb: Santhanam' in *Indian Express*: September 10 1998

enhanced computer simulation ability provided and in the capability to finally match China's tactical nuclear weapons capability.[65]

India's problem has been that China might be tempted to use tactical nuclear weapons in the event of a Chinese assault on Indian positions meeting fierce resistance or in the event of Indian special forces upsetting the time-table of a Chinese assault.[66] The sparsely populated Sino-Indian battlefield is ideal for the use of tactical nuclear weapons without fear of collateral damage. India's newfound ability to produce sub-kiloton tactical nuclear weapons now serves as a credible deterrent to any Chinese moves to use similar weapons.[67] Had this thesis been on the Sino-Indian conflict, this new development would hace severely affected any conclusions. However, as this thesis deals with the India-Pakistan confrontation, the conclusions reached have not been severely affected by the May tests

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<u>The Political/Economic Impact and International Reaction</u>

In chapter six of this thesis, it was argued that neither India nor Pakistan would test nuclear weapons for fear of sanctions. It is clear that the fear of sanctions was not enough to deter either country. International reaction followed the patterns outlined in chapter six. The United States was compelled by law to impose the stringent sanctions outlined in chapter six. Japan, Australia, Canada and some European countries imposed

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[65] P.Sawhney, 'India's nuclear tests: the military dimension' This was an article submitted to the *International Defence Review* in late May 1998, but was never published.

[66] loc.cit.

[67] loc.cit

sanctions of one kind or another and the G-8 agreed to block non-humanitarian loans from the World Bank and International Monetary Fund.[68] However, the United States and other countries were still keen to do business in India and as such the sanctions were not nearly as severe as they might have been. India's liberalization policy of the 1990s, created a fairly powerful business lobby in the United States against rigid imposition of sanctions.[69] India's traditional friends in France and Russia, and surprisingly, Germany, refused to impose trade sanctions and France and Russia continued to woo India for the sale of nuclear power reactors and conventional weapons.[70]

The impact of sanctions on India have been limited. There are signs that the Indian economy will post a growth rate of at least five percent this year.[71] Compared to the economic meltdown that has currently engulfed Asia, this is a very creditable performance. Moreover, the sheer size of the Indian economy renders it relatively secure.

In the case of Pakistan, there are serious fears of an economic collapse. Pakistan's economy has always been much more fragile than India's and Pakistan's external debt burden is staggering. Pakistan's debt burden stands at $ 36 billion or 72% of its Gross

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[68] S.Chakravarti & M.Joshi, 'The Indian Roadshow', *India Today:* June 22 1998, pp.14-17

[69] loc.cit. As far as World Bank loans are concerned, India will receive less than it seeks, but still over $2 billion per year.

[70] Russia signed a $2 billion dollar deal for two power reactors with India while obtaining orders for several more weapons systems from India.

[71] See *Economic Times*: 23 November 1998 - online edition http://www.economictimes.com. This quotes the Confederation of Indian Industry predicting a GDP growth rate for India of 5.5% this year

Domestic Product (GDP) and the prospect of no IMF loans would mean that Pakistan would have enormous difficulty in meeting its debt service payments.[72]

As mentioned earlier, there was considerable domestic support for the nuclear tests in both India and Pakistan and this continues, despite the sanctions. However, India and Pakistan represent two fine examples of the limits of foreign influence when pitted against strong domestic concerns. The BJP believed it needed to carry out the tests in spite of the consequences, while the Pakistani government caved into domestic pressure and tested despite strong pressure to desist.

The five established nuclear powers now have to contend with two overtly nuclear nations. The calls for nuclear 'roll-back' that came from the United States, China and the United Kingdom sound somewhat hypocritical. India and Pakistan took decisions regarding their national security based on their own assessments. No outside power can ever dictate these issues to South Asia. As such, foreign influence in this region will continue to be very limited.

The nuclear tests have possibly, however, paved the way for an honest dialogue between India and Pakistan. As mentioned in chapter six, this dialogue was always shrouded in deceit because of the inability to talk about nuclear stabilization. No progress has yet been made, but the tests do remove a major obstacle to honest dialogue between the two rivals. This honest dialogue is now more necessary than ever since the close proximity of the two countries could lead to misunderstandings over military manuevres and missile tests

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[72] Hussain & Chengappa, 'Bang for Bang', pp.14-15

Conclusion - Was there any warning ?

One of the fascinating things about the Indian nuclear tests is that they were not entirely unexpected. The BJP has never made any secret of its intention to develop nuclear weapons and in the past has indicated that it would test nuclear weapons if it came to power. It is amazing that few people expected them to actually do it.[73]

South Asia has been steadily weaponizing for a number of years. That nobody is certain if or when they actually weaponized is a testimony to the intense security that has surrounded the nuclear weapons programs in both countries. Now a covert weapons program has become an overt one and the World goes into a panic. This thesis has argued that India and Pakistan have been *de facto* nuclear powers for some time. No nuclear exchange has taken place, nor has there been a major conventional war (although there were some close calls ). These two nations have never even deliberately bombed a civilian target in any of their previous three wars.[74] These are not the acts of insane national leaderships. Panic accomplishes nothing and neither do sanctions.

It has been feared that South Asia's test would lead to increased proliferation, this may yet come to pass. However, the South Asian tests send a message to the five established nuclear powers that they cannot hold a monopoly on nuclear weapons forever. After nearly five decades of preaching disarmament, India and Pakistan seem to have decided: ' if you can't beat them - join them.'

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[73] On January 23 1998, the author interviewed a New Delhi based journalist - Mr.'L' - who told me that L.K.Advani, a principal figure in the BJP, had clearly stated that the BJP would conduct nuclear tests within two months if elected. My reaction was to laugh since I was extremely sceptical of this claim at the time.

[74] Look at *Time Magazine's* coverage of the 1971 war for some insight into this aspect. More people were killed in road accidents thanks to civil defence blackouts than from bombing.

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Captain Verma is the publisher of the *Indian Defence Review*

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Major Sawhney was the defence correspondent for the *Asian Age* newspaper as well as a Visiting Fellow at the Royal United Services Institute

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Mr. Chopra is Managing Editor of *Vayu Aerospace Review* - India's best known aviation journal. Mr. Chopra is also India's leading military aviation historian.

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